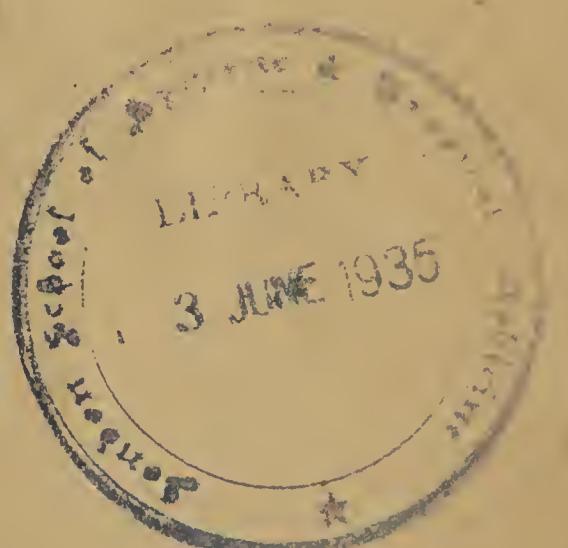


MINISTRY OF THE INTERIOR, EGYPT

**Department of Public Health**

**The Research Institute and the Endemic  
Diseases Hospital**

**THIRD ANNUAL REPORT  
1933**



CAIRO  
GOVERNMENT PRESS, BULÂQ  
1934



MINISTRY OF THE INTERIOR, EGYPT

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Department of Public Health

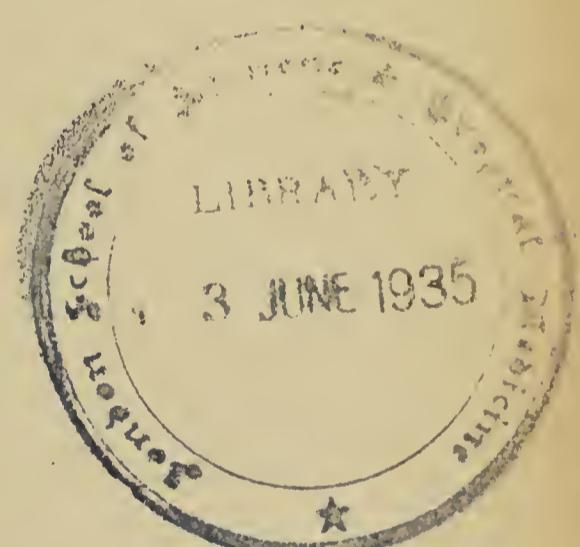
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Diseases Hospital

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THIRD ANNUAL REPORT  
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1934



*Cairo, August 14th, 1934.*

EXCELLENCY,

I have the honour to submit my report on the Research Institute and the Endemic Diseases Hospital and the work done during the year 1933.

I have the honour to be,

Excellency,

Your obedient Servant,

Dr. M. KHALIL BEY,  
*Director, Research Institute.*

H.E. THE UNDER SECRETARY OF STATE,

DEPARTMENT OF PUBLIC HEALTH,

MINISTRY OF THE INTERIOR,

CAIRO.



# THE RESEARCH INSTITUTE AND THE ENDEMIC DISEASES HOSPITAL, CAIRO

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**MINISTRY OF THE INTERIOR, EGYPT**

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**Department of Public Health**

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**The Research Institute and the Endemic Diseases Hospital**

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**Third Annual Report 1933**

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**FOREWORD**

The third year of the Research Institute has been marked with progress in different directions. A Malaria Research Station at Khan-ka was attached to the Institute from February 11, 1933. This station was re-arranged and a programme of investigation and research was laid down for gradual execution. The work of the station is included in the present report.

An expedition was sent to Siwa Oasis in January to study Malaria and other parasitic infections and to advise on a scheme of prevention. A survey of the rice fields of the Delta was undertaken in an early period after cultivation and also before the crop was ripe to record the species of mosquitoes usually breeding in the fields and their relationship to Malaria outbreaks.

A large collection of the parasites of the fishes of the Red Sea was made during the summer by the Director. It is expected to be rich in species new to Science. A focus of Dermal Leishmaniasis "Oriental Sore" was discovered in the Delta and a detailed study was made of the epidemiology and treatment of the disease.

It is gratifying to record that the work begun on the life history of Heterophyes in 1923 ended during the present year by discovering all the stages of the life history of this parasite and its first intermediate host. The second intermediate host was discovered in 1923.

An epidemic of Malaria broke out at Gabares, Behera Province. Unfortunately it was not notified to the Institute early enough. A study was made of the locality but it was too late to find infected mosquitoes. Arrangements were made with the Epidemic Section so that in future the Institute will be notified early enough to identify the mosquito responsible for the outbreak.

The Cairo Health Inspectorate collected a large number of mosquito larvæ from different localities of the city and its surroundings, these were identified by the Entomologist of the Institute.

*August 1934.*

M. KHALIL

PART I.  
REPORT ON THE SCIENTIFIC WORK

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SECTION 1.—Biochemical Section

(1) *Gastric Functions in Helminthic Infections.*

Seventy-one fractional test meals were carried out on forty unselected cases of various helminthic infections before and after treatment of the cases.

The methods adopted and the investigations done are as follows :—

- (a) Volume and character of the resting fluid.
- (b) Estimation of free and total acidity.
- (c) Estimation of total chlorides.
- (d) Estimation of pepsin.
- (e) Detection of bile, blood and starch in the samples.

A discussion of the results obtained is included in the report of the experimental pathology and medicine section with whom this work has been done in collaboration.

(Published in the Journal of the Egyptian Medical Association,  
July 1933).

(2) *The Lethal Effect of Chlorosene "T" and Ammonium Chloride Method of Water Sterilization on Schistosome Cercariae of the Human Type.*

At the request of the General Officer Commanding the British Troops in Egypt, this method of water sterilization was investigated.

It was found that chloramine prepared from chlorosene T and ammonium chloride will kill Schistosome Cercariae of the human type in tap water in the concentration of one part per million in thirty minutes and in raw unfiltered Nile water in the concentration of one part per million in one hour.

(3) *The Use of the Spectroscope in the Control of the Purity of Carbon Tetrachloride.*

While studying spectrum analysis in the University of Liverpool, Prof. Khalil Bey suggested using the spectroscope for testing the purity of carbon tetrachloride.

Two samples of carbon tetrachloride from Schering-Kahlbaum and from Albright and Wilson were first examined chemically for their purity using the standard chemical tests adopted by the Research Institute. Results are as follows :—

Test.	Albright and Wilson Sample.	Schering- Kahlbaum Sample.
Boiling point ... ... ... ... ...	76–77°C at 764 mm.	75·5–76·5° C at 761 mm.
Heavy volatile substances ... ... ...	26 mgrms.	22 mgrms.
Acidity and chlorides ... ... ...	Nil.	Nil.
Free chlorine ... ... ... ...	Nil.	Nil.
Heavy volatile oxydizing substances...	Nil.	Nil.
Sulphur compounds ... ... ...	Nil.	Nil.
Carbon bisulphide ... ... ...	Nil.	Nil.
Aldehydes ... ... ...	Nil.	Nil.
Other organic impurities ... ... ...	Nil.	Nil.

Thus, these two samples of carbon tetrachloride are chemically pure. They were then subjected to spectroscopic examination. For this purpose, the Hilger E 3 quartz spectrograph together with the Hilger rotating sector "long focus" were used.

Carbon tetrachloride itself transmits practically no rays below 250 u.u. Both samples showed some absorption in the U.V. portion of the spectrum at about 325 u.u.; but the head of the band could not be obtained even after using a 20 centimetres absorption tube. For this reason, 2 litres of each sample were distilled (using a fractionating column) and the first 1 per cent of the distillate were collected and examined. There was a well defined absorption band with the maximum at 318 u.u. This band was identified as due to carbon bisulphide. It could be inferred that carbon bisulphide is present in both samples of carbon tetrachloride in very minute traces.

#### (4) *Enol-Keto Tautomerism.*

The structure of Benzoyl Acetone.— $C_6H_5C(OH)=CHCO$ .  $C_6H_5$  and dibenzoyl methane  $(C_6H_5CO)_2CH_2$ .

An extended spectroscopic investigation into the structure of these compounds has been undertaken in association with Dr. Morton of the University of Liverpool. A brief outline will be stated here.

The structure of benzoyl acetone has been in the past the subject of many physical and chemical investigations, but the direction of enolization has not yet been definitely established.

The magnetic rotation and molecular refraction indicate that benzoyl acetone has the enol structure  $C_6H_5C(OH)=CH.CO.CH_3$ . The parachor of benzoyl acetone is very closely in value to a calculation based upon an open-chain structure  $C_6H_5CO.CH_2.CO.CH_3$ . The bromine titration method of K. H. Meyer led him to conclude that benzoyl acetone in alcohol solution exists as 94–96 per cent of a mono-enol in reversible equilibrium with the di-ketone. The method evidently cannot decide between structure  $C_6H_5C(OH)=CH.CO.CH_3$  and  $C_6H_5CO.CH=C(OH)CH_3$ , but Mayer favoured the structure  $C_6H_5C(OH)=CH.CO.CH_3$ .

Scheiber and Herold found that ozonization of benzoyl acetone gave chiefly benzoic acid and  $CO_2$  and the formation of some  $CH_3CHO$ . These chemical results therefore point to the structure  $C_6H_5C(OH)=CH.CO.CH_3$  although they do not exclude the presence of the isomeric enol  $C_6H_5CO.CH=C(OH)CH_3$  and the di-enol  $C_6H_5C(OH)=C=C(OH).CH_3$ .

Claisen considered the fission of benzoyl acetone by the action of alkali into acetophenone and acetate and the reactions of benzoyl acetone with ammonia (1), aniline (2) and hydroxylamine (3) and consequently Claisen suggested structure  $C_6H_5CO.CH=C(OH).CH_3$  as possibly representing benzoyl acetone.

Details of the spectrographic investigation of these compounds will be published in the Journal of the Chemical Society.

#### (5) *The Blood Chemistry in Ankylostomiasis.*

Pure cases of *Ancylostoma* infection are selected and the following blood chemical examinations are carried out before and after treatment of the patients :—

Serum proteins including :

- Serum albumin.
- Serum globulin.
- Serum euglobulin.
- Serum pseudoglobulin.

Blood glucose.

Blood calcium.

Blood chlorides.

Blood cholestrol.

Icterus index.

Blood iron.

Haemoglobin.

Owing to the difficulty of finding pure cases of Ancylostoma infection which are completely free from other parasites, the number of cases examined so far are only few. The work is still under investigation.

(6) *The Toxicity of Carbon Tetrachloride.*

Since the introduction of carbon tetrachloride on a large scale in the treatment of Ankylostomiasis, several deaths occurred following the administration of the drug. The cause of this poisoning is not definitely known, although several factors have been suspected to be the cause. Lately, Minot has brought forward evidence, based on experiments on dogs, that carbon tetrachloride poisoning resembles that resulting from guanidine, and that in both cases symptoms could be relieved and the life of the animal could be saved by calcium and glucose therapy.

Owing to the great importance of this problem, we felt the necessity of repeating this work of Minot. Results obtained so far show the following :—

When dogs are kept on a diet composed of lean meat alone, they invariably suffer from severe diarrhoea on the sixth or eighth day after commencing the meat diet. This diarrhoea lasts for about a week and during that period, some of the dogs die from emaciation. The dogs which survive show a great variation in tolerance to carbon tetrachloride. Thus, out of 30 dogs kept on meat diet for 3-6 weeks, 18 dogs died following the administration of the dose of 5 c.c. per kilo weight of carbon tetrachloride, while the other 12 dogs receiving the same dose lived without showing any toxic symptoms. At present, further animal experiments are carried out. Changes in the blood chemistry of animals on meat diet and after the administration of carbon tetrachloride are still under investigation.

(7) *The Effect of Antimony on the Liver.*

Several workers have reported that jaundice occurs following antimony treatment in Bilharziasis, and suggested that antimony plays an important rôle in producing hepatitis and jaundice.

To investigate this problem, the following liver functional tests, which are considered to be of greatest value in detecting liver damage, were performed on 71 Bilharzia patients before and at the end of treatment.

The liver function tests employed were :—

- (a) The Icterus Index.
- (b) The Van den Bergh's test.
- (c) Urobilinogen.
- (d) Bromsulphalein test.
- (e) Galactose tolerance test.
- (f) Roger's test.

Of the different liver functional tests employed, the galactose test proved to be of greatest value in detecting cases where liver damage is suspected. Thus, out of 40 cases with clinically pathological livers, the test was positive in 30 cases, *i.e.* 70 per cent.

As regards the effect of antimony on the functional capacity of the liver, we arrived at the following conclusions :—

- (a) Therapeutic antimony does not produce any disturbance of function of clinically normal livers in Bilharzia cases.
- (b) Therapeutic antimony course does not produce any disturbance of function of cirrhotic bilharzial livers, nor does it increase a previously existing disturbance.
- (c) As a matter of fact, improvement and even returning to normality of the liver functions occurred in certain cases, suggesting that the Bilharzia infection was the responsible factor in producing such disturbance, and that antimony by curing the infection, improves the liver condition in these cases.
- (d) Therapeutic antimony does not aggravate parenchymatous jaundice. On the contrary, 80 per cent of cases showed cure or definite improvement at the end of treatment. This proves that therapeutic antimony is not capable of increasing the damage of an already damaged liver cell.

(This work is under publication).

## SECTION 2.—Experimental Pathology and Medicine Section

Investigations carried out in this Section are mainly performed on the in-patients who are chosen and admitted for this purpose.

Experimental studies, connected with these clinical problems or independent, are as well carried out on experimental animals.

### A.—CLINICAL INVESTIGATIONS.

#### I.—*Studies on Anaemias in Egypt*

##### (1) *Helminthic Anaemia.*

As a result of extensive hæmatological investigations of a large number of cases of Helminthiasis with Anæmia together with gastric function studies, etc., it was possible to :—

- (i) Separate Helminthic Anæmia as a definite entity.
- (ii) Formulate its hæmatological picture as being constantly markedly hypochromic, micro or normocytic, non-hæmolytic, hypoplastic type of Anæmia with eosinophilia.
- (iii) Prove the rôle of each parasite in its production.
- (iv) Show the importance of thorough and complete investigations for correct diagnosis.

As to the various mechanisms of its production, experimental work is going on to complete these studies.

More detailed account of this work can be seen in the Clinical Report and in a separate publication.

##### (2) *Rarity of Pernicious Anæmia in Egyptians.*

Continuous search for cases of Addison's Anæmia has failed to detect a single case in the whole series of Anæmias studied. The possibility of modification in the usual picture by complicating endemic diseases has been taken into consideration. In spite of this, using the diameter index, corpuscular volume and Price-Jones curves in doubtful cases as well as the therapeutic test in about 100 cases of achlorhydric Anæmias, no case of macrocytic Anæmia was detected. Investigations into the various factors responsible for this extreme rarity is going on.

The absence of constitutional achylia has been demonstrated by studying the gastric secretion after alcohol and histamine in 185 normal children free from parasites; not a single case of achylia was found. (See clinical report).

(3) *Œdema in Anæmia.*

The mechanism of Œdema in cases of Anæmia was investigated in 22 cases in connection with the Biochemical Section. (See clinical report).

The variation of factors responsible as well as the importance of the nutritional element and hypoproteinæmia are emphasised.

The practical value of this investigation lies in indicating proper prognosis and treatment.

(4) *Therapeutic Trials in Anæmia.*

The effect of various therapeutic measures was followed by haemoglobin, reticulocytes, and R.B.C. estimations. The following methods were used:—

- (i) Full hospital diet.
- (ii) Treatment of parasites.
- (iii) Liver: raw liver, extracts by injection (Campolon, Hepracton, Inhepton).
- (iv) Vitamines: Marmite, Vitaminol, Vigantol, Yeast, etc.
- (v) Massive iron therapy: reduced iron, ferrous salts (Blauds), Scaly preparations (fer. et amon. cit., fer. et quin. cit.), iron peptonate, ferronovin.  
Iron injections (B.P.) intramuscularly were also used.
- (vi) Arsenic in the form of sodium cacodylate injections subcutaneously.
- (vii) Copper in the form of copper sulphate solution, 1 per cent, by mouth.

Results will be published later.

(5) *Circulatory System in Anæmias.*

Clinical investigations on frequency, nature and mechanism of haemic murmurs, variations in B.P., electrocardiogram and size of heart are under study.

II.—*Studies on Malaria.*

The following subjects have been investigated:—

- (1) Haematological studies on various forms of Malaria.

(2) Biochemical studies done in some cases in connection with the Biochemical Section. Variations in the icterus index and blood cholesterol were especially investigated for their significance in the haemolytic process.

(3) Studies on liver functions in various forms of Malaria.

(4) Studies on inoculation Malaria in nervous Syphilis.

(5) Investigations on the treatment of Malaria by Atebrin (see clinical report).

In this work, the following points were studied:

(i) Effect of Atebrin on clinical manifestations.

(ii) Effect of Atebrin on parasites.

(iii) Effect of Atebrin on blood picture.

(iv) Effect of Atebrin on liver functions.

(v) Comparison of immediate effects with those of Plasmochin, Plasmochin co. and quinine (this has been done in collaboration with the staff of the Khanka Malaria Research Station).

(vi) After-examination of patients as to incidence of relapse.

### III.—*Action of Antimony on the Liver.*

This work has been completed in collaboration with the Biochemical Section.

71 patients with and without diseased livers were submitted to clinical and functional studies before and after antimony treatment. Also the glycogen content of liver of rats on standard diet was estimated after antimony treatment and in controls. Results are under publication.

### IV.—*Carbon Tetrachloride Poisoning.*

The mechanism and factors responsible for the occurrence of poisoning from carbon tetrachloride are under experimental investigation in collaboration with the Biochemical Section (see report of Biochemical Section).

In addition, administration of the drug to patients with various pathological lesions is undertaken in the hospital to define the true contra-indication to its use and to help in the explanation of the various factors responsible for the occurrence of poisoning. Detailed results will be published later.

#### V.—*Investigations on Jaundice.*

50 cases of Jaundice were investigated clinically, biochemically, bacteriologically and occasionally radiologically.

The following points were the subject of investigation:—

- (1) Mechanism of the so-called catarrhal jaundice.
- (2) Rôle of helminthic infection: data are collected to show importance of helminthic infection in the causation of some cases.
- (3) Leptospirosis has been looked for in every case by examination of blood and urine by dark ground illumination and in suspicious cases by inoculation of guinea-pigs; no spirochaetes could be demonstrated in any case.
- (4) Relation to previous courses of antimony and to Bilharziasis were completed under No. III.

#### VI.—*Effect of Ketogenic Diet on Post-Bilharzial B. Coli Cystitis.*

Investigations are continued, 14 more cases have been added this year. Results will be published when sufficient data are available.

In addition, cases of clinical, experimental or of academic interest were studied, fully investigated and demonstrated.

#### B.—*TRIAL OF DRUGS.*

Various new drugs, supplied by factories or asked for, were submitted to trials on animals and patients with various diseases. For effects of these drugs see clinical report.

*Drugs tried.*

(1) *Fouadin Calcium*.—A concentrated preparation of Fouadin in combination with calcium was supplied by the Bayer Factory to replace the usual Fouadin, using smaller doses.

(2) *Vitaminol*.—A preparation of vitamine B., is under trial in cases of Pellagra with and without Anæmia.

(3) *Ferronovin*.—A preparation of iron with liver and copper for trial in cases with various forms of Anæmia.

(4) *Helminal*.—A vegetable extract recommended as an anthelminthic for Ascariasis—has been tried in various helminthic infections.

(5) *Dyscural*.—Ampoules of emetine and papaverine and tablets of Yatrene and paraverine—are under trial in cases of Amœbic Dysentery (in connection with the Helminthology and Protozoology Section).

(6) *Hepracton and Inhepton*.—Concentrated extracts of liver with and without arsenic respectively for intramuscular injections, are under trial in various forms of Anæmia, in Pellagra and in Cirrhosis with Ascites and Oedema.

(7) *Atebrin*.—Tablets and ampoules—has been tried in Malaria, Dysentery and is under trial in Filariasis.

C.—EXPERIMENTAL INVESTIGATIONS.

I.—*Hæmatological*.

(1) *Value of Halometer in separating macrocytic Anæmias*.—Was tested by comparing its readings with those obtained by more accurate methods for determining red cell diameter and volume (volume index and Price-Jones curves) in 20 cases of Anæmia with border line values of red cell diameter. Results showed extent of error by the Halometer to be 20 per cent. This diminishes extremely its value in this respect, especially in this country where it is essential to confirm the diagnosis before reporting any case of macrocytic Anæmia. As a result of this, we have discarded the use of the Halometer in spite of its easiness in our series of investigations.

## (2) *Reticulocytic Count.*

Owing to the difficulty of counting the reticulocytes in the drop cover glass method and the deleterious effects on the R.B.Cs. of the wet chamber and after-staining in the dye smear method of Schilling, various investigations have been undertaken with many solutions of various concentrations until a solution of brilliant cresyl blue in sodium citrate was obtained which has no deleterious effect on the size or shape of the R.B.Cs. The citrate was used as an anticoagulant to assist the dye to act on living cells for some time. It was preferred to the oxalate as the latter showed instability.

*Method.*—Solution used is B.C.B. 0·3 per cent in sodium citrate solution 2·5 per cent.

Two drops of this solution are mixed with one drop of blood from patient's finger on the end of a fat-free slide and left for 5 minutes, then stretched into a very thin smear. Examination by the oil emersion shows the unstained mature red cells and the reticulocytes with a blue net work inside them. The advantages of this method are:—

- (i) Solution used does not affect shape or size of red cell.
- (ii) Easiness and quickness of method.
- (iii) Constancy of results in patients and experimental animals has proved the exactness of the method.

It is recommended to prepare fresh solution every month.

This method has been adopted in our haematological studies in patients and experimental animals and has proved to be the easiest and most satisfactory in our hands for over a year.

## (3) *Effect of repeated haemorrhages on Reticulocytes.*

For this purpose, the average reticulocytic count of 15 rats, put on a standard diet, was determined to be 8 to 10 per cent. Then they were bled daily (1 to 2 drops of blood squeezed from tail) and reticulocytic curve followed. A rise up to 25 per cent was reached within the second week, sustained for a period of about a week and then gradual decline slowly occurred. By the third month, reticulocytic count was below their normal, and at end of the 4th month, it was about 2 per cent in the majority; two rats showed absence of reticulocytes suggesting aplasia and died about the 4th month.

The significance of this experiment shows that small repeated haemorrhages may lead, after an initial stimulation, to gradual hypoplasia of bone marrow which may reach even to a stage of aplasia.

This experiment has an important bearing in our studies on the mechanisms of Ancylostoma-Anæmia; for, although low reticulocytic value suggests in this Anæmia diminished activity on the part of the bone marrow, it could not differentiate between a toxic or post hæmorrhagic depression.

(4) *Effect of various local food stuffs on the nutritional Anæmia of Rats.*

The tendency to consider the nutritional factor of importance in the causation of Anæmias in Egypt suggested the investigation of the availability of iron in the various articles of diet given to our hospital patients for hæmoglobin metabolism. This is carried out by observing the curative effect of various food stuffs concerned, on the nutritional Anæmia of rats produced by pure milk diet. Details will be published later.

(5) *Action of Arsenic on Blood Regeneration.*

Observations on patients under arsenical treatment for Anæmia suggested necessity of studying the effect of arsenic on bone marrow activity. This is done on rats kept on a standard diet; hæmatological studies including H.B., R.B.C. and reticulocytic estimations are done before, during and for a long period after arsenic administration. Results will be published later.

*II.—Experimental Ankylostomiasis in Dogs.*

Dogs infected with *Ancylostoma caninum* are submitted to the following investigations:—

- (1) Effect of various grades of infection.
- (2) Hæmatological investigation to follow the stages of development of Ancylostoma-Anæmia.
- (3) Effect of diet on degree and rate of development of Ancylostoma-Anæmia. This has been suggested from observations on patients where similar degrees of *Ancylostoma* infection resulted in different grades of Anæmia.

*III.—Effect of Experimental Bilharziasis on the Activation of Bartonella Anæmia in Rats.*

This experiment is suggested as a preliminary study on the reticuloendothelial system in Egyptian Splenomegaly.

25 rats were infected with *Schistosoma mansoni* cercariae as this is the type affecting the liver and spleen. Blood of all rats was examined at intervals for *Bartonella muris* and accompanying Anæmia for a period of 10 months. In no rat could *Bartonella* be found in the peripheral blood. The rats were then splenectomised to determine those who were *Bartonella* carriers; these were found to be 11. P.M. examination of all rats showed that only 16 of them acquired the Bilharzia infection; out of these 8 were latent *Bartonella* carriers.

This experiment demonstrates that experimental Bilharziasis in rats within this period, does not diminish the preventive power of the R.-E. system on latent *Bartonella* infection, i.e. it does not disturb the function of this system in this respect.

#### IV.—*Hepatoliengraphy with Thorotrast.*

Before using this method in Egyptian Splenomegaly to see to what extent it will be of help to show the nature of the splenic enlargement in this disease, the following points were investigated:—

- (1) *Experimental effect of Thorotrast on the Reticulo-Endothelial System of Diseased Rats.*

It is essential to determine the effect of thorotrast on diseased livers and spleens where it is mainly indicated in human practice.

The following points were experimentally investigated:

- (a) Effect on the phagocytic activity of cell.
- (b) Effect on activating disease in rats :
  - (i) With latent *Bartonella* infection.
  - (ii) With *Trypanosoma lewisi* infection.

Detailed results of these experiments are under publication.

- (2) *Determination of method of administration and dosage necessary for visualisation of the enlarged spleen in cases of endemic Splenomegaly.*

(See clinical report).

- (3) *After-effect of administration and effect on liver functions in cases of endemic Splenomegaly.*

(See clinical report).

- (4) *Effect on activation of latent Malaria in Human cases.*

(See clinical report).

### SECTION 3.—Helminthology and Protozoology Section

#### I.—BILHARZIA.

##### A.—*Epidemiology.*

###### (1) *Bilharzia infection among the Dye-House Labourers.*

In March 1933, one of these labourers came to the Institute in a very debilitated condition. He was suffering from Bilharzia—intestinal and urinary—and Pellagra. His condition was so bad that all resources of treatment failed to bring him recovery and he died in April 1933. Going into his history, it was found out that he used to go to Ghamra Canal to wash the dyed stuffs. He used to go into the water from morning till noon to do his duty, he explained in detail how he used to feel the itching once he put his limbs into the water, and how he used to get ill after going there. He described the fever and the urticaria and later the dysenteric and urinary symptoms. He also mentioned that he had never been outside Cairo.

Immediately afterwards, we visited the place—a dead end canal that used to be the main old Ismailia Canal at its origin from El Khalig El Masri before it was filled up. It had been frequented by trade and passengers boats plying between Port Said, Ismailia, Suez and Cairo and the towns in between. Labourers and poor tramps go there looking for jobs or to have a wash or dip in its dirty water. Regularly, the canal is visited by the labourers of the poor dye-houses who cannot afford to have enough water to wash their dyed stuffs.

Snails were looked for by means of nettings, but this method did not help much and traps of palm leaves had to be put deeper in the water to guarantee a better catch. These traps were left for 5 to 7 days, after which period they gave a good variety of molluscs, mentioned in their order of frequency: Vivipara unicolor, Melania tuberculata, Cleopatra bulimoides, Bulinus dybowski and contortus, Lanistes bolteni and Planorbis boissyi. The latter was found only on two occasions.

Bulinus snails were subjected to examination, each one in a test tube containing fresh tap water, to find out if they had any Bilharzia infection. In June 1933, few Bulinus snails gave out *Schistosoma hæmatobium* cercariæ.

The two Planorbis gave no cercariæ.

The dye-houses were located and urine and faeces specimens were collected from their personnel including the people that go out to the canal.

Dye-Houses	Number of personnel	Males more than 12 years	Positive for Sch. haem.	Males under 12 years and Fem.	Positive for Sch. haem.
House No. 1 ... ... ... ...	17	11	3	6	1
House No. 2 ... ... ... ...	37	25	12	12	4
House No. 3 ... ... ... ...	33	20	12	13	2
House No. 4 ... ... ... ...	9	9	6	—	—
House No. 5 ... ... ... ...	15	15	7	—	—
<b>TOTAL ... ... ...</b>	<b>111</b>	<b>80</b>	<b>40</b>	<b>31</b>	<b>7</b>
Percentage ... ... ...	—	—	50%	—	22·5%

One had *Schistosoma mansoni* in his stools.

It will be seen from the above table that 50 per cent of the adult males harbour *Schistosoma haematobium* and most of these go out to the infected place. Two adult females were positive and although they had not been to this particular canal, yet they had been to other endemic areas. The rest of the positive cases were found among the children who used to go out to the same canal with their elder. The case positive for *Schistosoma mansoni* came from a highly endemic area.

#### (2) *Bilharzia Infection among the Attendants of the Child Welfare Centre, Bab el Shaaria.*

In 1932, the Medical Officer of Bab el Shaaria Child Welfare Centre, in Cairo, reported the incidence of 76 cases of Urinary Schistosomiasis among 181 women whose urine was examined in the Institute. An enquiry was conducted to find out if there was a common source of infection to the attendants of that Centre.

Out of 213 women examined in 1933, 74 passed living or dead ova in their urine. 179 of these were either born or brought up in endemic areas or had been for short visit to relatives in these places. The remaining 34 had never been out of Cairo. Among these 6 had the infection. It was found out that 4 lived near Ghamra Canal, one lived in the suburbs of Cairo and one lived in one of the poor quarters of Cairo. It was quite possible that they had their infections from using unfiltered water brought to their houses from infected localities by water carriers.

#### (3) *Ein el Seira.*

A series of ponds lie to the West of Cairo near Mokattam Hills in an artificial depression made in this locality by building contractors who

used to take their lime stone from there. The area of the main pond is 200 square metres and is secluded by a fence from the rest of the ponds. It is used as a bathing pool and owing to the sulphurous quality of the water, it is prescribed to the poor people suffering from skin diseases. The composition of the water is as follows:—

	Parts per million
Total salts ...	... 53,400
Chlorides	... 41,250
Sulphates	... 7,210
Calcium	... 2,643
Magnesium	... 1,980
Sulphides	large amount.
Nitrate and nitrites...	traces

The locality was examined to see if the water was suitable for the breeding of Bilharzia snails. As it might be concluded from the amount of salt in the water, these could not survive in the locality. The only snail found in great numbers was "Paludina musænensis."

#### B.—*Prevention*

##### *The Effect of Different Reagents on the Bilharzia Snails.*

###### (1) *Balanitis Ægyptiaca berries.*

In July 1933, Archibald reported the lethal value of the fruit, bark and other parts of the tree *Balanitis ægyptiaca* on the bilharzial molluscs, miracidia, cercariae and the cercariae of animal trematodes. It was found advisable to repeat these experiments and we had to look for the plant in the Egyptian territory. In Cairo, only two trees have been found, one in the Botanical garden of the High School of Agriculture, the other in a private garden. We had been told by the Frontier Districts Administration that this tree abounded in the Eastern Desert near Qena.

Few berries were brought through courtesy of the High School of Agriculture and the experiment was repeated as follows :—

The dry ripe berry weights 2:5 grms. of which the kernel weights 2 and the dry flesh 0:5 grms. The latter was put in 500 c.c. of water and kept for 36 hours. Archibald states that the contents of one berry mixed with 80 litres of water is lethal enough to *Planorbis* and *Bulinus*. Dilutions of 1/5000, 1/25000, 1/10000 and 1/5000 were tried. Five snails of *Bulinus*, *Planorbis*, *Cleopatra* and *Melania* were put in these dilutions. The contents of each vessel were examined daily to determine the rate of mortality among each kind.

Dilution	24 h.		48 h.		72 h.		96 h.		120 h.		Kind of Snail
	L.	D.	L.	D.	L.	D.	L.	D.	L.	D.	
1/50000 ...	5	—	5	—	5	—	5	—	3	2	Bulinus.
	5	—	5	—	5	—	4	1	4	—	Melania.
	5	—	5	—	5	—	5	—	5	—	Cleopatra.
	5	—	5	—	5	—	5	—	5	—	Planorbis.
1/25000 ...	5	—	5	—	5	—	4	1	4	—	Planorbis.
	4	1	2	2	2	—	1	1	1	—	Bulinus
	5	—	5	—	4	1	3	1	2	1	Melania.
	5	—	3	2	3	—	3	—	3	—	Cleopatra.
1/10000 ...	5	—	5	—	—	—	—	—	—	—	Planorbis.
	3	2	1	2	—	—	—	—	—	—	Bulinus
	5	—	5	—	3	2	2	1	2	—	Melania.
	3	2	4	1	1	1	1	—	1	—	Cleopatra.
1/5000 ...	3	2	2	1	—	—	—	—	—	—	Planorbis.
	4	1	2	2	1	1	—	—	—	—	Bulinus.
	4	1	2	2	1	1	—	—	—	—	Melania.
	3	2	3	—	2	1	2	—	1	1	Cleopatra.
Control ...	5	—	5	—	5	—	5	—	5	—	Planorbis.
	5	—	5	—	5	—	5	—	5	—	Bulinus.
	5	—	5	—	5	—	5	—	5	—	Melania.
	5	—	5	—	5	—	5	—	5	—	Cleopatra.

L.=Living.

D.=Dead.

(2) *Disinfectant Fluid against the Bilharzia Snails (Prince Regent).*

In July 1933, we received a sample of Prince Regent to try its effect on the Bilharzia Snails in Egypt. It was reported from the Sudan that a dilution of 1/100000 gave a snail mortality of 98 per cent, whereas a dilution of 1/200000 made up with 5 per cent of commercial salt gave a mortality of 100 per cent.

Different dilutions of the reagent were made up with and without salt and were tried on Planorbis and Bulinus. The non-motile snails

were taken out of the solutions and left in fresh warm water before they were condemned. Results will be seen from the following table:—

Dilution	4 h.		48 h.		72 h.		96 h.		120 h.		Kind of Snails
	L.	D.									
1/200000 ... }	5 5	— —	Bulinus. Planorbis.								
Sod. Chloride { $\frac{1}{2}\%$ + 1/200000}	5 5	— —	4 3	1 2	2 2	2 1	1 2	1 —	— —	1 2	Bulinus. Planorbis.
1/100000 ... ... }	5 5	— —	Bulinus Planorbis								
Sod. Chloride { $\frac{1}{2}\%$ + 1/100000}	4 —	1 5	4 —	1 —	3 —	1 —	1 —	2 —	— —	— —	Bulinus. Planorbis
1/50000 ... ... }	5 5	— —	2 5	3 —	— 5	2 —	— 4	— 1	— —	— —	Bulinus. Planorbis.
Sod. Chloride { $\frac{1}{2}\%$ + 1/50000}	— —	5 5	— —	Bulinus. Planorbis.							
1/25000 ... ... }	2 4	3 1	— 4	2 —	— 1	— 3	— —	— 3	— —	— —	Bulinus. Planorbis.
Sod. Chloride { $\frac{1}{2}\%$ + 1/25000}	— —	5 5	— —	Bulinus. Planorbis.							
1/10000 ... ... }	— —	5 5	— —	Bulinus Planorbis.							
Nile Water ... }	5 5	— —	5 5	— —	4 5	1 —	4 5	1 —	4 5	1 —	Bulinus. Planorbis.
Sod. Chloride { $\frac{1}{2}\%$ ... ... }	4 4	— —	1 3	4 1	— 3	1 —	— 1	— 2	— —	— 1	Bulinus. Planorbis.





FIG I.—*Pirenella conica*. The First Intermediate Host of *Heterophyes heterophyes*.

It would be seen that the minimum dilution to kill snails in 24 hours is 1/1000 without salt and 1/25000 with salt. Note also should be taken that common salt alone in a dilution varying from 5 to 6 per thousand will kill the snails.

## II.—*Trematode Infection among Snails.*

Large numbers of snails from different localities were examined. Unrecorded new species of cercariae were met with and experimental examination was carried out to determine the adults and final hosts. The Schistosome cercaria mentioned last year was thoroughly investigated. The adult of another echinostome cercaria from *Planorbis boissyi* was determined and proved to be *Nephrostomum ramosum* Sonsino 1894, a parasite of *Ardeola ibis ibis*, the common buff-backed heron. Details of this research are under publication. Other unrecorded cercariæ are still under investigation.

### *The Life History of Heterophyes heterophyes.*

The outstanding feature in this work was the discovery of the cercaria of *Heterophyes heterophyes*. The adult trematode was first seen by Bilharz 1851 in the intestine of a small boy who died in Qasr el Aini Hospital. It was described in detail by Looss 1896 who also reported it in dogs and cats. The search for its life history dates back to 1923 when the cysts of the metacercariæ were met with in the muscles of 99 per cent of the *Mugil cephalus* "Bouri" bought from the Cairo fish market to which it was imported from the Lake Manzala. Snails from the fresh water canals near this locality were examined and lophocercous cercariæ were met with and experimentally proved to be those of a trematode belonging to the genus *Monorchotrema*. Snails from the lake were then collected. *Pirenella conica* was the most prevalent. They were found to be infected with lophocercous cercariæ. These were kept with fish (*Gambusia affinis*) which were brought up in the laboratory and free from infection. Cysts were found in the muscles of these fish and it was found that three weeks had to elapse before the metacercariæ were mature and ready for infection. Kittens and pups born and brought up in the Laboratory in order to insure their freedom from any previous infection, were fed on the infected fish. When they were sacrificed 7 days later, adult *Heterophyes heterophyes* were found in their small intestine. (Fig. I).

Details of this work will be published soon.

### III.—*Field Work.*

#### (1) *Cutaneous Leishmaniasis in Egypt (Oriental Sore).*

“Oriental Sore” is known to be endemic in the countries lying to the East of Egypt. In Palestine it is known as “Jericho boil.” In Syria, it is known as “Aleppo Button.” In Mesopotamia, it is known as “Baghdad Boil.” It has been reported from the Anglo-Egyptian Sudan where also Kala Azar is known to exist near the Abyssinian Frontiers. Cases were also recorded from Tripoli and the countries lying to the West.

In Egypt, genuine cases of Oriental sore, in which *Leishmania tropica* was demonstrated microscopically, were first recorded by Ferguson and Richards in 1910. These authors named the disease “Parasitic Granuloma.” In 3 cases out of their series of 10 cases, the parasites were found, the rest were diagnosed clinically. They also recorded a case found to be microscopically positive by Dr. Bitter. These cases were observed in Qasr el Aini Hospital in 2 years.

These authors stated that the disease was confined to males and that they never obtained any history of similar cases in the same village from which infection might have been acquired.

In 1923, Kligler reported two cases from Kantara on the Suez Canal. In the same year, Economou et Petzetakis recorded a case from Alexandria and Panayotatou also reported two cases from Alexandria.

Occasional cases at long intervals present themselves at the Qasr el Aini Hospital and are diagnosed clinically as Oriental sore and occasionally the diagnosis is confirmed by finding the parasites.

During 1932, two cases were suspected by the Director to have contracted the infection at Salhia near Kantara. Investigations resulted in finding 3 doubtful cases amongst the children and large numbers of *Phlebotomus papatasii*.

During 1933, a case was brought by a medical student to be diagnosed microscopically. This patient reported that many members of her family inhabiting a village to the North of Zagazig were suffering from the same disease. This village and the neighbourhood were carefully surveyed during September, October and November of 1933.

The whole inhabitants of 5 villages were examined individually for active Oriental sore or healed ulceration. The diagnosis was confirmed

in uncontaminated ulcers by finding the Leishmania tropica parasite under the microscope. The result of this survey was:

Name of village	Total Inhabitants	Number Examined	Active Sore	Healed Sore
Ezbet Ibrahim Bey Abdel Rahman ...	234	234	45	45
Ezbet el Mosalami ... ... ...	118	116	19	23
Kafr Ageeba ... ... ...	885	865	180	213
Ezbet el Zaafaran ... ... ...	95	95	13	36
Ezbet el Nagagra ... ... ...	76	74	5	24
TOTAL ... ... ...	1,408	1,384	232	341

All these villages belong to Markaz Hehia in Sharkia Province. Several villages lying to the east and to the south of this area were visited and as many of the inhabitants as available on the spot were inspected. These villages extended to Markaz Fakous to the east and Markaz Zagazig to the south. The result was as follows:

Name of villages	Number examined	Number of Active sore	Number of Healed sore
Ezbet el Guindi ... ... ... ...	27	3	6
Ezbet Abdalla ... ... ... ...	17	1	1
Ezbet Maher ... ... ... ...	18	—	4
Salamon ... ... ... ...	45	3	9
Menshat el Monasterli ... ... ...	4	2	2
Daramoss ... ... ... ...	100	6	7
Dahtamon ... ... ... ...	73	3	3
Sargara ... ... ... ...	32	2	—
Kafr el Sawaki ... ... ... ...	60	3	8
Kafr el Mosalamieh ... ... ...	7	1	1
Beni Aamer ... ... ... ...	70	2	9
Kafr Mousa Omran ... ... ...	66	2	10
El Alawish ... ... ... ...	42	2	5
Kafr Abaza ... ... ... ...	35	10	3
Kafr Ghorab ... ... ... ...	38	7	11

The endemic area so far examined extends over 30 kilometres in diameter, this incidence becomes distinctly less as we travel away from Kafr Aguiba, however the area lying to the north and that lying to the west are not yet examined.

It was evident that cases of Oriental sore were diagnosed sometimes by local practitioners as syphilitic ulcerations. For this reason, the Venereal Diseases Clinic in Zagazig was visited. The Medical Officer in charge was aware of the presence of cases of Oriental sore and had already diagnosed many cases. His diagnosis was based on the clinical appearance. Amongst the 200 cases examined between August 14 and September 27, 1933, there were 36 cases diagnosed as Oriental sore, these cases came from 26 villages and 5 cases from Zagazig itself. The villages were:

Elwa.	Zarzamoun.	Mit Abu Ali.
El Edwa.	Toucher.	Hehia.
El Nakhas.	Doueda.	Heriah.
El Aslooogi.	Ezbet Abu Hashem.	Téhra el Ora.
Nazl el Hayan.	Gazala.	Kafr el Housr.
Bani Aamer.	Kafr el Hokama.	Kafr Awadalla.
El Shobek.	Lalobeh.	Kafr Mohsen.
Kafr Abdel Aziz.	Kafr El Mosalmieh.	Mosallamieh.
Khelwet Aby Hashem.	El Sowa.	

### *The Parasites.*

Out of 20 cases examined on the first visit to the village, 11 showed parasites. The Leishmania tropica parasite was later demonstrated microscopically in 26 cases out of 50 cases examined. The parasites were also cultivated successfully on N N N medium and the Leptomonad forms were observed. Experimental inoculations of man and animals were made and are still being followed.

### *Distribution of Cases in the Houses.*

Multiple lesions in the same patient were generally observed. Autoinoculation by scratching seems to be the cause. The distribution of the disease in the houses of the village offers no peculiarity; practically all the houses are infected to the same extent. No quarter of the village can be said to enjoy relative immunity.

### *Sandflies.*

Sandflies were common during September and early October and gradually became less frequent as the cold weather approached. The majority of the sandflies were found to be Phlebotomus papatasii. This species invades houses and was caught naturally fed. They increase in number in the houses in the late hours of the night.

None of the large number of this species that were dissected contained leptomonad forms. Even those that were fed on sores swarming with parasites revealed no infection when dissected later.

The other species of sandfly found was *Phlebotomus squamipleuris*. This species appears about 6-7 p.m. and is attracted by artificial light. None of the specimens caught contained blood. This species has not been recorded from Egypt before.

### *Clinical Studies.*

A detailed clinical study of the cases and the types of ulcer was made and will be embodied in a publication that will appear soon.

### *Treatment.*

Various methods of treatment were followed and the results are being analysed. 266 cases were treated with 14 different methods and various drugs. The results will be published later.

### *(2) The effect of *Heterophyes heterophyes* on Man.*

In November 1933, a mission was sent from the Institute to Mataria (Daqahliya) where the infection with this worm was rife among the inhabitants.

70 cases of pure infection were found among 323 cases examined. Most of the cases were collected from among the school boys and fishermen. The symptoms were as follows :—

	Number	Percentage
Colic ... ... ... ... ... ... ... ...	37	53
Diarrhoea ... ... ... ... ... ... ...	34	48
Pain on pressure of iliac fossa ... ... ... ...	18	26
Headache ... ... ... ... ... ...	11	16
Nausea and vomiting ... ... ... ...	10	13·3
Pain on pressure round the umbilicus ... ...	6	8·6
Hypochondriac pain... ... ... ...	4	5·7
Large Liver ... ... ... ...	4	5·7
Debility ... ... ... ...	3	4·3
Spleen enlarged... ... ... ...	1	1·4

The stools were examined for occult blood and were found negative except in two cases suffering from diarrhoea with mucus. Gastric secretions were within normal limits. The haemoglobin was estimated as compared with that of 20 normal persons.

Haemoglobin.	Infected cases	Normal cases
Less than 70 %	3	—
70-80 %	64	15
More than 80 %	3	5

Therefore, this infection could not cause Anæmia. Eosinophils ranged from 3-30 per cent of the differential count.

## SECTION 4.—Medical Entomology Section

The work carried out in this Section falls under the following headings :—

## I.—Identification of insects sent to the Institute.

## II.—Organisation and supervision of the Khanka Malaria Research Station.

III.—Field work—Malaria surveys at Sîwa Oasis, Gabariss, Hehia (Sharkîya Province) and the Rice Fields of Lower Egypt.

#### IV.—Research problems under investigation.

## I.—Identification of Insects sent to the Institute.

During the year 1933, 51 bottles containing larvae and adult mosquitoes were sent to the Institute mainly from the Cairo Health Inspectorate. The species found were as follows:—

(1) *Anopheline*:

Anopheles pharoensis    ...    ...    ...    ...    ...    ...    ...    ...    6

(2) *Culicinae* :

(a) *Culicini* :

														Specimens
Culex laticinctus	...	...	...	...	...	...	...	...	...	...	...	...	...	21
Culex deserticola	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Culex perexiguus	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Culex laurenti	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Culex pipiens	...	...	...	...	...	...	...	...	...	...	...	...	...	23

(b) *Aedes* :

Aedes aegypti	...	...	...	...	...	...	...	...	...	...	...	...	...	9
Aedes caspius	...	...	...	...	...	...	...	...	...	...	...	...	...	2

(c) *Theobaldia* :—

Theobaldia longiareolata	...	...	...	...	...	...	...	...	...	...	...	...	...	6
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In addition to the above, the following nematocerous larvae were sent to the Institute :

Chironomus Sp. ?

Ceratopogon Sp. ?

The actual localities in which *Anopheles pharoensis* and *Aedes aegypti* were found are as follows :

*Anopheles pharoensis*.

- (1) Alexandria—Mex Barracks of the Egyptian Army Troops : several adults sent on September 7, 1933.
- (2) Heliopolis (Cairo)—Royal Air Force Camp : several adults sent on September 14, 1933.
- (3) Between Mary Girgis and Maadi (near Cairo) : larvæ found in small ponds along side the Railway line, sent on November 1, 1933.
- (4) Maadi (near Cairo) : larvæ found in a small pond north of the Railway line, sent on November 6, 1933.
- (5) Gîza : larvæ found in a small Canal at Orman Gardens, sent on November 23, 1933.
- (6) A small Canal at Ein Shams : larvæ sent on November 13, 1933.

*Aedes aegypti (Stegomyia fasciata)*--from Cairo and its Suburbs.

1. Manshiet el Bakri, 12 Borham Street: larvae sent on September 18, 1933.
2. Hilmîya (Zeitûn), 3 Safwat Pasha Street: larvae found in a small tank in a house, sent on September 20, 1933.
3. Hilmîya (Zeitûn): larvae found in a small collection of water in a house, sent on September 20, 1933.
4. Maadi, Street No. 10: larvae found in a small collection of water, sent on October 31, 1933.
5. Maadi, Street No. 10: larvae found in a small collection of water in the house of Etreby Bey, sent on October 31, 1933.
6. Cairo, 10 Hilmîya Street: larvae found in a water fountain in the house of Sherif Ahmed Bey, sent on November 8, 1933.
7. Matarîya : larvae found in a small canal at El Mesalla Street, sent on November 12, 1933.
8. Zamalik, Wilcox Street : larvae found in a small collection of water in the house of Mohammed Bey Tewfik, sent on November 19, 1933.
9. Helwan : larvae found in a small puddle of water in the English School, sent on December 23, 1933.

The presence of 9 specimens of *Aedes aegypti* (the Yellow Fever mosquito) collected from various parts of the city is a warning for the close inspection of the movements of individuals arriving in Egypt from countries in which Yellow Fever is endemic, specially those arriving by Military Aeroplanes from West Africa.

The co-operation of the Health Inspectorate of Cairo City with this Institute is highly desirable in order to make a thorough and systematic survey of the mosquito breeding places in the city of Cairo.

II.—*Organisation and supervision of the Khanka Malaria Research Station.*

The work carried out in the Station includes the following:—

- (a) Field work.
- (b) Work carried out inside the Station.

A.—*Field Work.*

The area supervised by the Khanka Malaria Research Station is about 240 square kilometres. It extends from El Marg in the south to El Minaiar in the north and from Gebel el Asfar in the east to Sendewa in the west.

The eastern part of the area abuts on the desert and is barren and sandy. The slope of the land is from east to west. The cultivated part of the area gets its irrigation water from the Ismailia Canal or its tributaries. Most of the ponds of the area are due to the high water level of the Ismailia Canal. The chief villages in the area are : El Marg, El Khossous, Sariakous, Kafr Hamza, Abou Zaabal, Sendewa and Gebel el Asfar.

Gebel el Asfar deserves special mention as a source of a serious outbreak of Malaria which occurred during 1923–1924. 300 cases of Malaria were reported in May and June 1924 from the Khanka Lunatic Asylum out of a population of 1,300. In consequence of this outbreak, a Committee was appointed to deal with the matter. The recommendations of the Committee were put into action with good results.

In March 1930, a Malaria Station was erected at Khanka and in February 1933, the Station was attached to the Research Institute and Endemic Diseases Hospital.

The area under the control of this Station was divided into four sections. Four mosquito collectors (Malahiz) were selected. Every one of them was put in charge of one section and was asked to make a weekly tour of his area and to submit a weekly and a monthly report to the Resident Medical Officer. They were trained to do the following :—

- (1) To make sketch maps of the breeding places.
- (2) To collect larvae and mosquitoes and to differentiate between Anophelines and Culicines. The identification of species was done at the Station or in the Institute by the Entomologist.
- (3) Breeding and mounting of mosquitoes.
- (4) Taking thin and thick films and staining them.
- (5) Distribution of quinine.
- (6) Supervision of antimalaria measures undertaken in his area.

The following are the main types of breeding places found in the area :—

- (1) Permanent marshes and ponds and temporary outcrops of seepage water.

- (2) Irrigation channels and drains.
- (3) Rice fields, palm groves and clover cultivations.
- (4) Burrow pits along Railway lines and burrow pits dug for building purposes.
- (5) Foot prints occurring in marshy areas.
- (6) Unused wells and sakias.
- (7) Cabbage leaves (Anopheles pharoensis larvae found once in a small collection of water between the leaves).

*Species of Mosquitoes.*

The mosquito survey of the area showed the presence of the following larvae (see sketch map I):—

- (1) *Anophelini.*
  - (a) Anopheles pharoensis.
  - (b) Anopheles multicolor.
- (2) *Culicini.*
  - (a) *Culex.*
    - (i) Culex pipiens.
    - (ii) Culex laurenti.
    - (iii) Culex quasigelidus.
    - (iv) Culex perexiguus.
    - (v) Culex laticinctus.
    - (vi) Culex pusillus.
  - (b) *Aedes.*
    - (i) Aedes caspius.
    - (ii) Aedes Aegypti.
  - (c) *Theobaldia.*  
Theobaldia longiareolata.
  - (d) *Uranotaenia.*  
Uranotaenia unguiculata.

From sketch map I, the following may be noted :

- (1) The Anophelines found in the area are : *Anopheles pharoensis* and *Anopheles multicolor*. These two species are evenly distributed over the area.
- (2) *Anopheles pharoensis* was mainly collected from Rice fields. It was also found in drains, irrigation channels and burrow pits where there was an abundant growth of weeds. It was not found in foul water or disused wells.
- (3) *Anopheles multicolor* was collected frequently from Marg and El Birka. It was found in brown stagnant salty water, where there was not a lot of vegetation (see photograph fig. 5).
- (4) *Aedes aegypti* (the Yellow Fever mosquito) was found in a small collection of water in the vicinity of El Khoussous. The distribution of Culicines is as follows :—

Rice Fields ...	{	Culex laurenti. Culex perexiguus. Culex quasigelidus. Culex pipiens.
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*Culex pipiens* was mainly found in disused wells and sakias. *Aedes caspius* was frequently found in foul water especially near the drains of mosques. The latter is probably the commonest larva in the area..

#### *Anti-mosquito measures.*

- (1) Filling of birkas.
- (2) Cutting of weeds and vegetations.
- (3) Larvicides.
- (4) Breeding of *Gambusia affinis*.
- (5) Scheme to drain and fill Birket el Hag.

#### *(1) Filling of Birkas.*

In filling of birkas, the following plan was adopted :

- (a) To determine whether the birka was temporary or permanent.
- (b) The situation of a birka in relation to inhabited centres.
- (c) A detailed Anopheline survey throughout the year.

Most of the permanent and temporary ponds in the area under the control of the Station are due to the high water level of the Ismailia

Canal or its tributaries ; some however are due to burrow pits dug for the sake of making mud bricks. The latter are usually found in most villages and anti-malarial Law should be enforced to prevent such occurrence (Photo 4).

In some of the large permanent ponds, small puddles of water were found along the periphery. The pond itself was free from mosquito larvæ whereas the puddles were teeming with Anopheeline larvæ. In such cases the puddles were filled or connected with the main pond.

An area of about 19,184 square metres was filled during 1933–1934.

The following table gives the breeding places that have been filled by the labour corps of the Station. The cost of filling was borne by the owners :—

Town or Village.	Kind of breed- ing place.	Site.	Area. sq. m.	Owner.	Date of filling.
Marg ...	Small pond	South of El Marg	240	Hassan Ahmed...	9-2-1933
Birka ...	„ „	South of El Birka	312	Ismail el Kadi...	11-2-1933
Birka ...	„ „	„ „ „	420	Hassan Galal ...	20-2-1933
Birka ...	„ „	„ „ „	376	Hassan ... ...	27-2-1933

The following are the Government Ponds which have been filled by the Station :—

Town or Village.	Kind of breeding place.	Site.	Area. sq. m.
Kafr Ebian ...	2 small ponds	South-east Ezbet el Habashi ...	—
El Khanka ...	Small pond ...	New road between Khanka and Abou Zaabal ... ... ...	—
El Khanka ...	Small pond ...	North-west of Khanka Market.	1,878
El Marg ...	Small pond ...	North-east of Marg ... ... ...	13
El Marg ...	Small pond ...	Dahr el Turba ... ... ...	288
El Khousous ...	Small pond ...	South of burial ground ... ...	105
El Khousous ...	Small pond ...	South of burial ground ... ...	600
El Birka ...	Small pond ...	North-west of the village...	48
El Birka ...	20 small ponds	North-west of the village...	—
El Birka ...	2 large birkas	Near the village... ... ...	1,525
El Birka ...	Several small birkas... ...	North of the village ... ... ...	4,200
Sariakous ...	Several ponds	North-west and south-west of the village ... ... ...	2,751
Arab el Ayaida	Small pond ...	Ezbet el Ayaida... ... ...	20



FIG. 4.—Temporary Pond in the Birkah Village. The earth was dug out to make mud bricks.



FIG. 5.—Typical breeding place of *Anopheles multicolor* in the Birkah village.  
Note the salty nature of the surrounding land.



The following table shows the Birkas that have been filled by the owners at the request of the Station:—

Town or Village	Kind of breeding place	Site	Area sq.m.	Owner
El Menaiar ...	Pond ... ...	East of the town ...	2,100	Mahmoud Hassan.
El Alag ... ...	Temporary small pond	North-west of the village ... ... ...	—	Abdel Meguid Shukshuk.
El Alag ... ...	Temporary small pond	South-east of the village ... ... ...	—	Sayed Gad.
El Khanka ...	Pond ... ...	South-west of the town ... ... ...	2,100	—
El Marg ... ...	Temporary Pond	Near town ... ...	140	Bayoumi Nassar
El Marg ... ...	Temporary pond ... ...	South of town ... ...	200	Ibrahim el Saha
El Khoussous ...	Temporary pond ... ...	S.W. Ezbet Dr. Abdel Salam el Ayadi ...	25	Dr. Abdel S. el Ayadi.
Kafr el Shorafa	Temporary pond ... ...	North of the village	25	Madbouli Ali Younis.
El Birka ...	Temporary pond ... ...	In the village ... ...	1,130	El Sayed Taha.
El Alag ... ...	Temporary pond ... ...	South-east of the village ... ... ...	125	Abdel Kadir. Abdel Hafiz.
El Alag ... ...	Temporary pond ... ...	South West of Ezbet el Princissa ... ...	560	H.E. Princess Nimat.

## (2) Removal of Weeds, Shrubs and Grasses.

A study of the weeds and grasses is of some importance in anti-malarial work and wherever possible, it is better to uproot the weed than to cut it as cutting may encourage its spread.

The following weeds have been found in the area of the Khanka Malaria Research Station :—

- (a) *Potamogeton crispus.* (هليس)
- (b) *Potamogeton pectinatus L.* (دبل الفرس)

These two weeds are common in the ponds of Abu Zaabal, and being shallow rooted, it is better to uproot them whenever it is possible as they quickly germinate and grow after cutting.

(c) *Polygonum senegalense*—Meissn commonly known as (بِرْكَة). This was found along some parts of Ismailia Canal. It is a robust plant with a strong rootstock and is difficult to uproot.

(d) *Cyperus alopecuroides*—Rottb. (أَسْعَى). This was found along some part of Gebel el Asfar drain. It invades the water ways. The stems of this weed are used for making mats, and *Anopheles pharoensis* are often found in the water in which it grows.

In addition to the above, there are several other plants which will be identified later.

In some cases, the weeds were used to fill some of the puddles surrounding big ponds.

The following table shows the places, the weeds of which have been cleared by the labour corps of the Station:—

Town or Village	Kind of breeding place	Site	Area in Sq. m.	Owner
El Minaiar ...	2 ponds ... ...	N.W. Ezbet Mershak.	6,300	Mishel Mirshak.
Sariakous ...	Pond ... ...	S. of burial ground of village ... ... ...	—	Government.
Sariakous ...	Pond ... ...	N. of burial ground ...	597	Government.
Sariakous ...	Pond ... ...	E. of burial ground ...	570	Government.
Sariakous ...	Pond ... ...	Awad Gindi ... ...	1,200	Government.
Abu Zaabal ...	Burrow pit ...	Railway burrow pit E. of Ismailia ...	1,400	Government.
Abu Zaabal ...	Pond ... ...	E. of Ismailia opposite Prison ... ... ...	42,000	—
Abu Zaabal ...	Temporary pond ... ...	Known as El Shiri pond ... ... ...	—	El Shiri.
Abu Zaabal ...	Small pond ...	S. of Delta Railway line ... ... ...	—	Government.
Abu Zaabal ...	Small pond ...	E. of Krabigo mill ...	476	Government.
Abu Zaabal ...	Small pond ...	E. of Ismailia opposite Prison ... ...	—	—
Kafr Ebian ...	Pond ... ...	Known as El Nakbi pond ... ... ...	900	Government.
El Khanka ...	Drain ... ...	Gebel el Asfar main drain ... ... ...	—	Government.
El Khanka ...	Drain ... ...	Subsidiary drain to the main drain ... ...	—	Government.

Town or Village	Kind of breeding place	Site	Area in sq. m.	Owner
El Minaiar ...	2 ponds... ...	N.W. Ezbet Mershak.	6,300	Michel Mershak.
Sariakous ...	Pond ... ...	S. of burial ground ...	—	Government.
Sariakous ...	Pond ... ...	N. of burial ground ...	597	Government.
Sariakous ...	Pond ... ...	E. of burial ground ...	570	Government.
Sariakous ...	Pond ... ...	Awad Gindi ground ...	1,200	Government.
Abu Zaabal ...	Burrow pit ...	Railway burrow pit E. of Ismailia ...	1,400	Government.
Abu Zaabal ...	Pond ... ...	E. of Ismailia opposite Prison ... ...	42,000	—
Abu Zaabal ...	Temporary pond'... ...	Known as el Shiri pond	—	El Shiri.
Abu Zaabal ...	Small pond ...	S. of Delta Railway line ... ... ...	—	Government.
Abu Zaabal ...	Small pond ...	N. of Erabigo mill ...	476	Government.
Abu Zaabal ...	Small pond ...	E. of Ismailia opposite Prison ... ...	—	—
Kafr Ebian ...	Pond ... ...	Known as el Nakbi pond ... ... ...	900	Government.
El Khanka ...	Drain ... ...	Gebel el Asfar Main Drain ... ... ...	—	Government.
El Khanka ...	Drain ... ...	Subsidiary drain to the main drain ... ...	—	—
El Khanka ...	Pond ... ...	N.W. of town ... ...	1,925	Government.
El Marg ...	14 Temporary ponds... ...	Near Marg ... ...	4,300	Government.
El Khosos ...	Pond ... ...	W. of town ... ...	8,400	El Shiri.
El Khosos ...	Pond ... ...	N. of burial ground...	—	Government.
El Khosos ...	Pond ... ...	W. of town ... ...	7,400	El Shiri.
El Khosos ...	Pond ... ...	Between burial ground and Ezbet Tannous	2,800	Government.
El Khosos ...	Pond ... ...	N. of town ... ...	4,200	Hassan Kasim.
El Khosos ...	Pond ... ...	S. of town ... ...	2,800	—
El Khosos ...	Pond ... ...	N.W. of burial ground	14,400	Government.
El Birka ...	81 Temporary ponds... ...	N. of village ... ...	24,500	Government.
El Birka ...	Drains ... ...	N. of village ... ...	1,770	Government.

The following table gives the irrigation channels and drains which have been cleared of their weeds by their owners at the request of the Malaria Station:—

Town or Village	Kind of breeding places	Site	Owner
Kafr Hamza ...	Misqa ... ...	W. to Ezbet Bayoumi Abu Shanab ... ... ...	Bayoumi Abu Shanab.
El Minieh ...	Misqa ... ...	N.W. of village ... ...	Abbas el Azhari.
El Minieh ...	Misqa ... ...	N. of village ... ...	Hussein Abbadi.
El Minieh ...	Misqa ... ...	N. of village ... ...	Sheikh Mohamed el Zayati.
El Minieh ...	Misqa ... ...	N. of village ... ...	Amin Omar.
Sariakous ...	2 Misqas ...	S. of village ... ...	Hussein Bedir.
Sariakous ...	2 Misqas ...	S.E. of Agricultural Bank Dépôt ... ... ...	Osman el Kholi.
Sariakous ...	2 Misqas ...	S. of Ezbet Badawie l Mansi	Zaki AbdelRahmn
Seriakous ...	2 Misqas ...	S.W. of Ezbet Mohamed Saleh ... ... ...	Mohammed Saleh.
Sariakous ...	2 Misqas ...	S. of Ezbet el Yamani ...	Hussein el Kabbas
Abu Zaabal ...	Several drains	Ezbet el Rami ...	Sorsok.
Abu Zaabal ...	Several drains	Near Om Nafaa ...	Rizk Ibrahim.
Kafr Ebian ...	Misqa ... ...	W. of Ezbet Hakim Abu Dunia ... ... ...	Hakim Abu Dunia
El Khanka ...	Misqa ... ...	S.W. Ezbet Fikri Abu Shanab ... ... ...	Fikri Abu Shanab
El Khanka ...	Misqa ... ...	N.W. Ezbet Fikri Abu Shanab ... ... ...	„ „ „
El Khanka ...	Misqa ... ...	N. Ezbet Fouadah ...	Fouadah.
El Khosos ...	Pond ... ...	S. Ezbet Amin Loutfi ...	Greiss Nakhla.
El Khosos ...	Misqa ... ...	S.W. Ezbet el Omdah ...	Mohammed Said.
El Khosos ...	Misqa ... ...	E. Ezbet Naguib ...	Mohamed Ismail.
El Khosos ...	Misqa ... ...	Ezbet el Nasieh ...	Rifai el Shiri.
El Khosos ...	Misqa ... ...	W. Ezbet Mahmoud Mahfouz ... ... ...	Dr. Ayadi.
El Khosos ...	Pond ... ...	S.W. Ezbet Tannous ...	Gorgi Tannous.
Kafr el Shorafa	16 drains ...	W. of Ezbet Ades ...	Ades.
Kafr el Shorafa	—	N.W. Ezbet Ades ...	Ades.

### (3) *Larvicides.*

The larvicides used by the Khanka Malaria Research Station are :—

(a) Oiling.

(b) Paris Green.

Oiling is mainly used in controlling larvae in water tanks, disused wells and sakias and inspection chambers.

At present, some experiments are being carried out by including copper sulphate in varying dilutions in the mixture to see its effect in controlling snails and floating vegetation. In oiling, it is essential to remove all weeds beforehand.

In using Paris Green, oven-dust was used as a diluent. This has the great advantage of being light and does not block the blowing bellows. This larvicide only affects the surface feeder, viz. anopheline larvae and its use is restricted to the breeding places of anopheline.

(4) *Breeding of Gambusia affinis fish.*

At present, a scheme is being worked out whereby at least two permanent breeding places for Gambusia are found in each of the four sections of the area controlled by the Malaria Station.

This will enable each mulahiz to transport the fish from one part to the other easily.

It may be pointed out that before introducing Gambusia in any pond, it is necessary to fish out all eels and other big fishes beforehand.

A big breeding pond, about 16 square metres, has been made at the entrance of Gebel el Asfar Farm.

The following table shows the ponds in which *Gambusia affinis* was introduced to check the breeding of Anopheline larvae:—

Town or Village	Type of breeding place	Site	Owner
Abu Zaabal ...	Several ponds.	On the agricultural road between El Khanka and Abu Zaabal ... ... ...	Government.
Abu Zaabal ...	Several ponds.	San Factory, N. to Abu Zaabal Prison ... ...	Ahmad Abdel Krim.
Abu Zaabal ...	Drain ... ...	El Akrasha W. of Gebel el Asfar Drain ... ... ...	Mohammed Wanás
Abu Zaabal ...	Several ponds.	On the side of Gebel el Asfar Drain ... ... ...	Mohammed Wanás
Abu Zaabal ...	Several ponds.	Near Decauville Railway, North of Prison ... ...	Mousa Hassan.
Abu Zaabal ...	Burrow pit ...	Along Railway line between Khanka and Abu Zaabal	Government.
Abu Zaabal ...	Several ponds.	On the sides of Delta Railway line N.E. of Ismailia Canal ... ... ...	Delta Railway Line
Abu Zaabal ...	Ponds ... ...	Opposite Abu Zaabal Prison	Government.
Abu Zaabal ...	Pond ... ...	Opposite Railway Depot of Abu Zaabal ... ... ...	Government.

Town or Village	Type of breeding place	Site	Owner
Abu Zaabal ...	Pond ... ...	Known as Birket Sadik ...	Government.
Kafr Ebian ...	Birka ... ...	Known as El Takbi ... ...	Government.
Kafr Ebian ...	Small pond ...	Known as El Shiri ... ...	Government.
Khanka ... ...	Birka ... ...	Known as El Baimi, Arab El Hidah ... ... ...	Government.
Khanka ... ...	Drain ... ...	Gebel el Asfar Farm, S.W. of Canal ... ... ...	Government.
Khanka ... ...	Birka ... ...	N.W. el Khanka ... ...	Government.
Sariakous ...	Birka ... ...	Known as Awad el Gindi.	Awad el Gindi.
Sariakous ...	Birka ... ...	Known as Bir Abu Douma	Awad el Gindi.
Sariakous ...	Birka ... ...	Known as El Zeini ... ...	Awad el Gindi.
Sariakous ...	Birka ... ...	South of town ... ... ...	Government.
Sariakous ...	Birka ... ...	East of town ... ... ...	Government.
Sariakous ...	Birka ... ...	North of burial grounds ...	Government.
Sariakous ...	Small pond ...	East of burial grounds ...	Government.
Sariakous ...	Small pond ...	North of burial grounds ...	Government.
Sariakous ...	Small pond ...	East of burial grounds ...	Government.
Sariakous ...	Small pond ...	North-East of burial ground	Government.
Sariakous ...	Small pond ...	West of burial grounds ...	Government.
Sariakous ...	3 Small ponds	Ezbet Badawi el Mansi ...	Zaki Enabeh.
Kafr Hamza ...	Several ponds	On the road from Kafr Hamza to Sariakous ...	—
Alag... ... ...	Small pond ...	Ezbet Abdel Meguid Shak- shak... ... ... ...	Abdel Meguid Shakshak.
Alag... ... ...	Drains ... ...	Ezbet el Princess N. & S. of road to Minieh ...	H.E. Princess Nimat.
Alag... ... ...	Drains ... ...	Ezbet el Princess ... ...	„ „ „
Marg ... ...	Drain ... ...	West of town ... ... ...	„ „ „
Marg ... ...	Drain ... ...	North of Marg ... ... ...	„ „ „
Marg ... ...	Small pond ...	Zahr el Tourbah ... ...	Government.
Khosous ...	Birka ... ...	North of Khosous ... ...	Hassan Kasim.
Khosous ...	Birka ... ...	West of Khosous ... ...	El Shiri
Khosous ...	Birka ... ...	South of Ezbet Amin Loutfi	Greiss Nakhla.
Khosous ...	Birka ... ...	North of burial grounds ...	Government.
Khosous ...	Birka ... ...	South of burial grounds ...	Government.
Khosous ...	3 ponds... ...	South of Khosous ... ...	Amin Lutfi.
Kafr el Shorafa	Several drains.	Ezbet Aedes ... ... ...	Ades and Sons.
El Birka ...	Several ponds.	North of village ... ...	Saleh Enan Pasha
El Birka ...	Several drains.	Ezbet Harhouri ... ...	Ades and Sons.

(5) Scheme to drain Birket el Hag in the village of Birkah.

Birket el Hag is a large swamp situated just north of the village Birkah. The swamp is formed from seepage water from Tewfikia Canal which runs to the south of the village. 200 metres to the

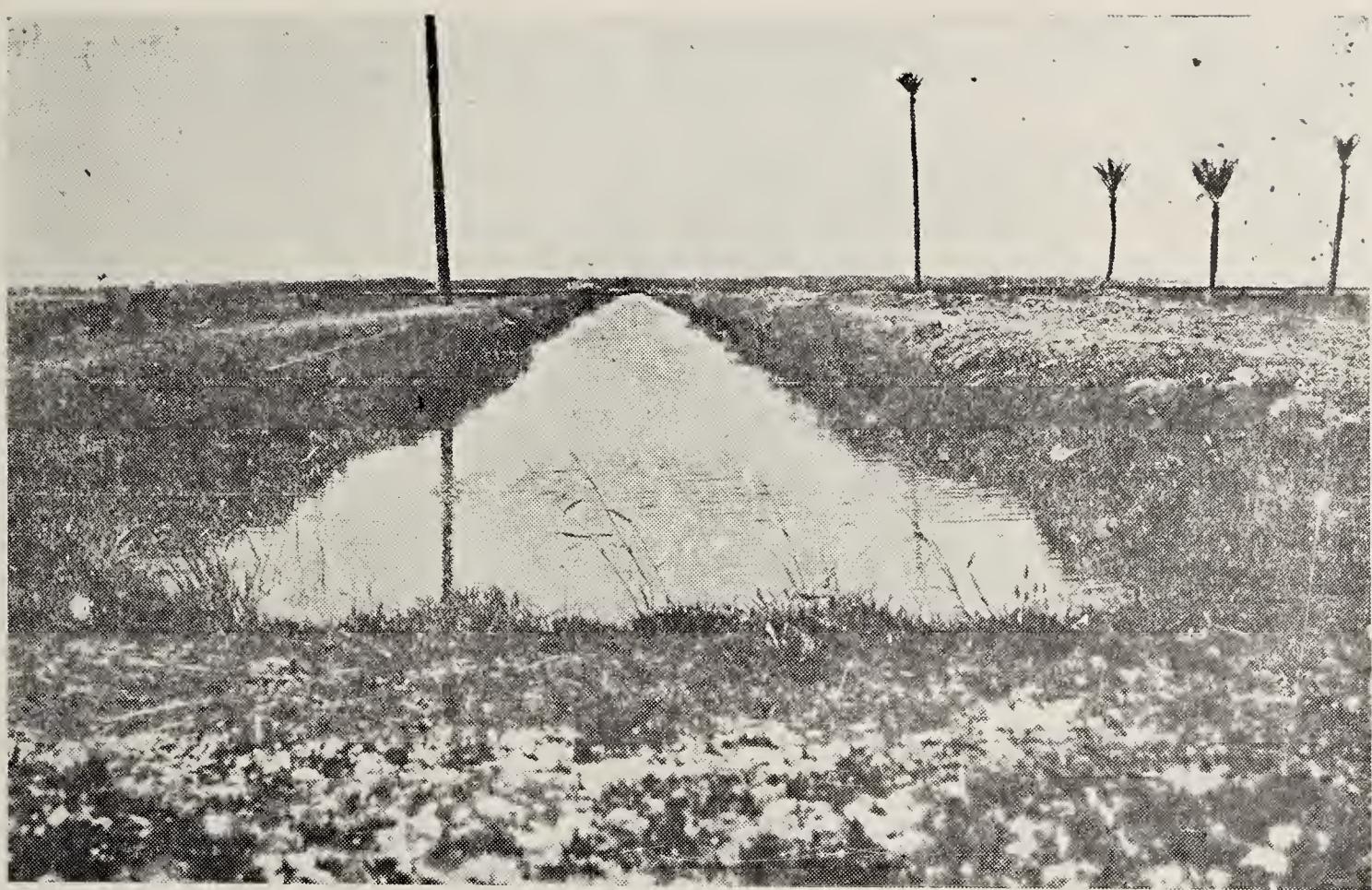


FIG. 2.—Beginning of Bilbeis Drain. Note the Salty and boggy nature of the soil.



FIG. 3.—Birket el Hag. A permanent pond north of the village. It is a breeding place for *Anopheles multicolor*.



North of the swamp is the begining of Bilbeis drain (see Map 2). The swamp is a favourite breeding place for Anopheles multicolor.

The following levels were taken by the District Engineer :—

	Metres above sea level.
Present water level of Bilbeis drain ... ... ... ...	12·56
Calculated water level of Bilbeis drain ... ... ... ...	12·80
Surface water level of the swamp ... ... ... ... ...	12·98
Bottom level of the swamp ... ... ... ... ... ...	12·70

A scheme is under examination to lower the present water level of Bilbeis drain by erecting a sucking pump beyond the Railway crossing (see Map 2) which will lower the water level of Bilbeis drain to 11 metres above sea level, and thus drain the swamp and boggy area surrounding it and make it suitable for cultivation. If the pump is erected near Abou Zaabal, it will be possible to drain also the pond surrounding Abou Zaabal, but in this case, the costs will be increased.

#### B.—Work carried out Inside the Station

##### (1) Examination of Malaria Patients.

The number of patients admitted for parasitic infections other than Malaria is limited to 10, but in addition to these, blood films were taken from all those who gave a history of Malaria. The object of accepting 10 cases is to attract the anaemic patients to the Station and to make the Station popular by giving the specific treatment. The scheme proved extremely successful. The cases attending during the year showed 300 per cent increase over those of the last year.

The following Table I gives a comparison of cases examined for Malaria in 1931, 1932 and 1933 :—

Year	Number of cases examined for Malaria	Positive for Malaria	Percentage	Remarks
1931 ... ... ... ...	1,332	150	11	
1932 ... ... ... ...	1,684	91	5·4	
1933 ... ... ... ...	4,586	316	6·8	

Of the 316 cases of Malaria, 272 had benign tertian, 43 had malignant tertian and 1 had quartan Malaria. The latter was a case of a Bedouin who contracted the disease in Hedjaz.

Graph I shows the monthly distribution of benign and malignant Malaria cases in the area.

It is evident from this graph that :—

(a) The Malaria months in the year are from June to December and the maximum incidence is in the month of September.

(b) Malignant Malaria season is always the same as benign tertian but the monthly incidence is much less than benign tertian.

Table II shows the monthly distribution of Malaria cases from the area supervised by the Station and from outside :—

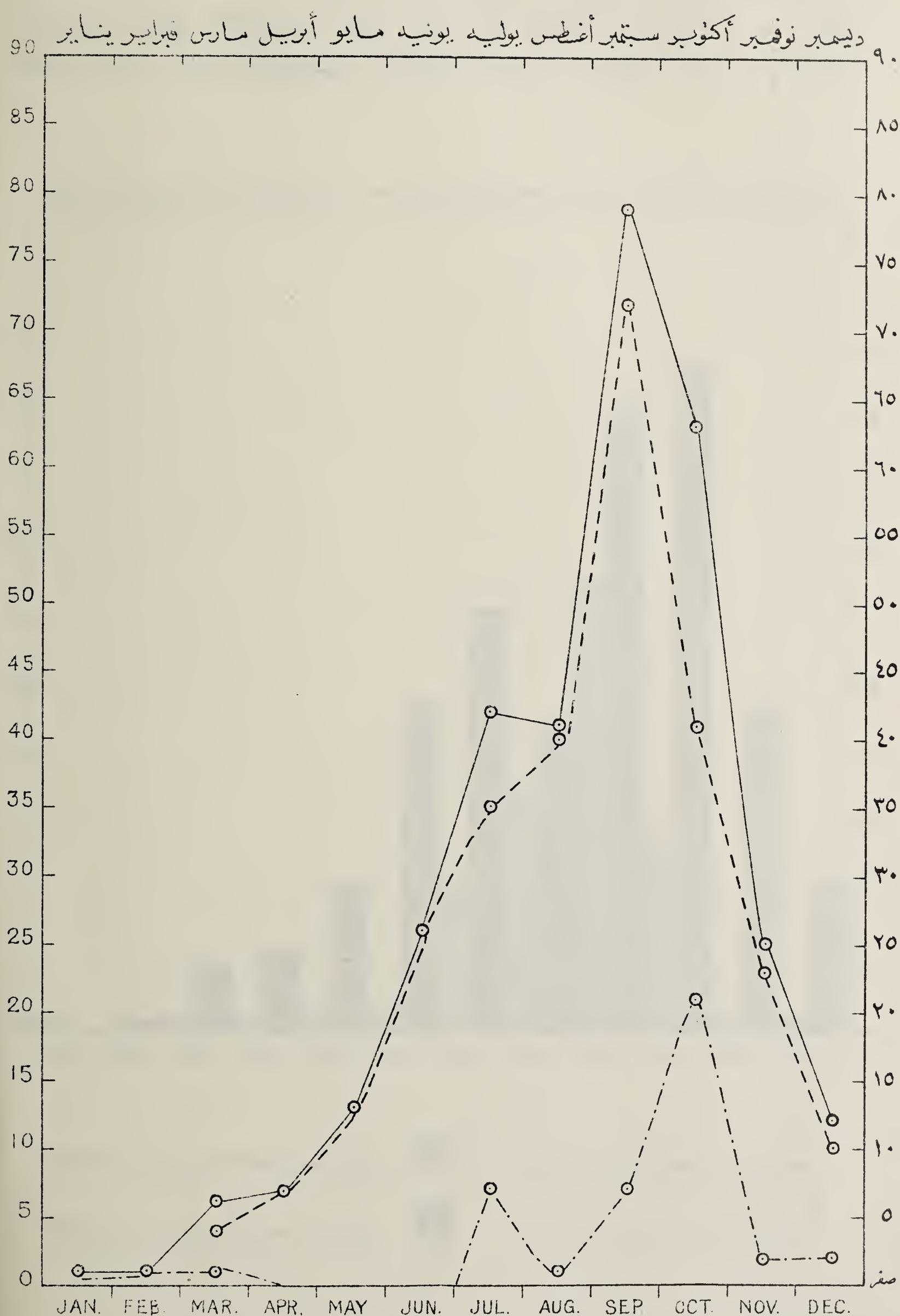
Month	Benign Tertian		Malignant Malaria		Quartan Malaria		Total
	Inside	Outside	Inside	Outside	Inside	Outside	
January	...	...	—	—	—	1	1
February	...	...	—	—	1	—	1
March	...	...	—	—	1	—	6
April	...	...	6	1	—	—	7
May	...	...	11	2	—	—	13
June	...	...	24	2	—	—	26
July	...	...	26	9	5	2	42
August	...	...	22	18	1	—	41
September	...	...	43	29	3	4	79
October	...	...	36	6	13	8	63
November	...	...	22	1	2	—	25
December	...	...	10	—	1	1	12
<b>TOTAL</b>	...	...	<b>204</b>	<b>68</b>	<b>27</b>	<b>16</b>	<b>316</b>

From the above table, it is evident that the total number of Malaria cases who came from places beyond the boundaries of the Station are 85.

Graph 2 shows the monthly distribution of Malaria cases from the area supervised by the station and from outside. It shows that the monthly distribution of Malaria cases from outside follows the monthly distribution of Malaria from the area controlled by the Station.

رسم بياني "ا" بحالات الملاريا الحميدة والخبيثة موزعة على أشهر السنة

GRAPH "1". SHOWING THE MONTHLY DISTRIBUTION OF MALARIA  
BENIGN, & MALIGNANT



Total, number, of Malaria cases \_\_\_\_\_  
Benign Malaria. \_\_\_\_\_  
Malignant Malaria. \_\_\_\_\_

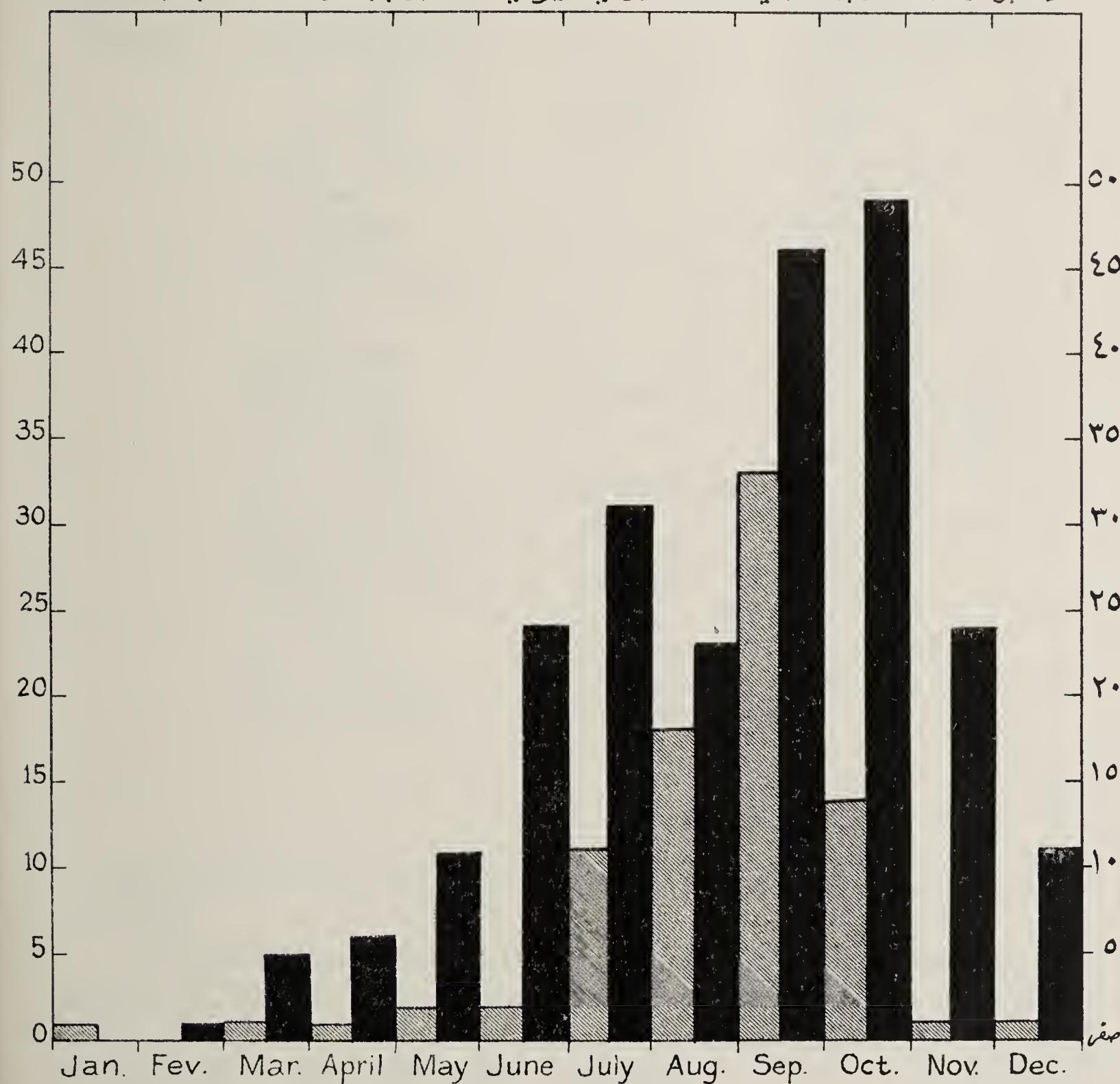
مجموع أصابات الملاريا  
ملاريا ثلاثة حميدة  
ملاريا خبيثة



رسم بياني «٢» بحالات الملاريا في منطقة محطة أبحاث  
الملاريا بالمخانكة موزعة على أشهر السنة

GRAPH: 2 SHOWING MONTHLY DISTRIBUTION OF MALARIA  
INCIDENCE FROM THE AREA CONTROLLED BY THE  
MALARIA RESEARCH STATION & FROM OUTSIDE

ديسمبر نوفمبر سبتمبر أغسطس يوليه يونيو مايو أبريل مارس فبراير يناير



Malaria cases from outside... ■

أصابات من خارج المنطقة

Malaria cases from inside.... ■

أصابات من داخل المنطقة

Notes: Inside means area under the control of the Malaria Research Station.



Table III gives the distribution of Malaria cases from outside:—

Markaz	Town	Number of Malaria Patients	Markaz	Town	Number of Malaria Patients
Quesna ...	Om Khnak ...	1		Arab el Nagdi	1
Ashmoun ...	Samadoun ...	1		Arab el Gho-	
Shebin El Kanater ...	Arab el Sawalha	8	Mashtoul ...	reiri ... ...	1
	Ezbet Moh. Sabet (Kafr el Shoubak) ...	1	Belbeis ...	Arab el Oleikat	1
	Ezbet Hassan Sabet ... ...	1		El Beltieh ...	1
	El Ghaafrah ...	4		Mashtoul... ...	6
	El Attarah ...	4		Inshas ... ...	2
	Ezbet el Gharsi ... ...	4		El Zawamel ...	11
	Kafr Sidwa ...	5		Ezbet Shawki	1
	Tahanoub ...	1		Belbeis ... ...	1
	Noub Taha ...	1		Tell Anieh ...	1
	Kafr Shebin ...	4		Kafr Abrash ...	1
	Kafr el Shoubak	1		Nasha ... ...	1
	Kafr Taha ...	3		El Sahafa ...	1
	Ezbet Ali Sabet	2		AghourelKubra	1
	Shebin el Kananir ... ...	1		Shubra el Balad	1
	El Ahraz ...	1		Zawiet el Nagar	1
	El Kazainah ...	2		KomHamada	1
	Arab Gohainah	1		El Tirieh ...	1
				Giza ... ...	1
				Zagazig ... ...	1
				Fayoum ...	1
				Cairo (Zei-	
				toun) ...	
				Ezbet Florine...	1
				Ismailia ... ...	1
				(Hedjaz) ...	1
				Total Number ... ...	85

N.B.—These are from 12 Markazes outside the Khanka Malaria Research Station and one from Hedjaz.

It is evident from table I that the number of patients examined for Malaria in 1933 has been almost trebled in comparison to the number examined in 1932; and that the actual increase of Malaria cases in 1933 is mainly due to the large number examined.

The increase in the percentage of Malaria cases in 1933 to 1932 can be attributed to the following :—

(1) The number of cases who came from outside, i.e. 85 cases. 58 per cent of these were Malaria cases as proved by microscopical examination.

(2) The examination of contacts of all Malaria cases who came from the area supervised by the Station. In this way, 10 additional Malaria cases were spotted out, who otherwise would not have come to the Station.

(3) Improved technique in the thick drop examination. 10 drops of blood are examined instead of 4.

The Malaria distribution in the towns and villages of the area supervised by the Station is shown in the sketch map No. 3 together with the Anopheline survey of the area.

Table IV gives the Malaria incidence calculated as percentage among the patients examined for Malaria from the main towns of the area supervised and from outside:—

Town or Village	Number of Patients examined for Malaria	Positive Cases	Percentage
Khanka ... ... ...	796	56	7
Sariakous ... ... ...	476	48	10·8
Kafr Hamza ... ... ...	264	29	10
Abou Zaabal ... ... ...	215	33	15·3
El Alag ... ... ...	169	7	4·1
Kafr Abian ... ... ...	91	10	10·9
Sindwa ... ... ...	51	12	23·5
Khosous ... ... ...	16	2	12·1
Marg ... ... ...	10	1	10
El Birkah ... ... ...	8	2	25
Minieh ... ... ...	6	—	—
Minaiar ... ... ...	3	1	33·3
(Outside the area controlled) ... ... ...	146	85	58

Discarding the places from which less than 50 patients were examined, one may conclude the following :—

(1) The Malaria incidence is highest at Sindwa, Abou Zaabal, Kafr Ibian, Sariakous, Kafr Hamza and Khanka in the order mentioned.

(2) The Malaria incidence from outside (*i.e.* the area not supervised by the Station) is more than 5 times the average incidence of cases from inside. This is due to the fact that most of the patients attending the Station from outside were Malarious, otherwise they would not have taken the trouble to travel a long distance to the station.

(3) From sketch map No. 3, no correlation could be made between the Malaria incidence and the Anopheline survey.

*N.B.*—The incidence of Malaria infection in localities from which less than 50 cases were examined is unreliable, owing to the small percentage of the inhabitants examined.

(2) *Treatment of Malaria.*

On the recommendation of the Research Institute, the following experiment was carried out on Malaria patients at the Khanka Station.

Groups of Malaria cases were selected. Each group was given one kind of drug and the period of treatment was limited to 5 days. The blood was examined every day to determine the rate of disappearance of the parasites from the blood. The following drugs were used :—

- (a) Quinine bihydrochlorate (5 gr. tablets) : 2 grms. daily.
- (b) Plasmochin compound: 6 centigrams plasmochin + 0.75 ctgrm. quinine daily.
- (c) Plasmochin simple : 3 centigrams daily.
- (d) Atebrin tablets: 3 centigrams daily.
- (e) Atebrin ampoules (Injections) : 1 c.c. daily.

Table V shows the details of the experiment carried out:—

Drug used	Number of patients treated	Species of Malarial parasite	Duration of treatment		Minimum time for disappearance of parasite	Maximum time for disappearance of parasite	Average time for disappearance of parasite	Percentage and time of relapse
			Days	Days				
Quinine 5 grains ...	4	B.T.	5	—	—	5	—	—
Quinine 2 grains ...	4	B.T.	7	—	—	6 $\frac{3}{4}$	—	—
Plasmochine co. ...	32	B.T.	5	1	4	2.2	One relap.=3%	
Plasmochine co. ...	12	M.T.	5	1	6	5 $\frac{3}{4}$	—	
Plasmochine simple	25	B.T.	5	1	5	2.8	One relap.=4%	
Plasmochine simple	4	M.T.	8	6	9	7.5	—	
Atebrin tablets ...	26	B.T.	5	1	5	2.7	—	
Atebrin ampoules...	29	M.T.	5	1	6	3.2	About 8 relapses = 32 % 8 relapses = 17 % (after 2 months).	

It will be seen from the above that :—

(a) Atebrin tablets and plasmochine co. are the best drugs as far as the average time of the disappearance of the parasites is concerned. Relapses are however commoner after the use of this drug.

(b) Plasmochine simple is the least efficacious drug as far as the rate of the disappearance of the parasites is concerned.

(c) Further trials with quinine are still under investigation and no conclusions could be drawn yet.

(3) *Parasitic Diseases (other than Malaria).*

The number of patients admitted for parasitic infections in the Station is limited to 10 per day. The methods of diagnosis and treatment are those of the Research Institute.

Table VI gives the Sex, Age and Seasonal Distribution of Parasitic Infections :—

MONTH	FEMALES UNDER 12 YEARS						FEMALES OVER 12 YEARS						MALES UNDER 12 YEARS						MALES OVER 12 YEARS						
	Bilharzia	Urimary	Intestinal	Ascariis	Ancylostoma	Other Parasites	Bilharzia	Urimary	Intestinal	Ascariis	Ancylostoma	Other Parasites	Bilharzia	Urimary	Intestinal	Ascariis	Ancylostoma	Other Parasites	Bilharzia	Urimary	Intestinal	Ascariis	Ancylostoma	Other Parasites	
January	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
February	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
March	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
April	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
May	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
June	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
July	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
August	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
September	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
October	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
November	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
December	...	...	...	...	...	...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
TOTAL	...	...	...	...	...	...	133	7	114	99	44	183	7	237	236	97	259	14	177	117	78	567	47	548	279

Table VII gives the percentage of infection of Parasitic Diseases calculated on the basis of Number of the Infections which amount to 3,274 :—

Disease		Number of infections	Percentage
Bilharzia :—			
Urinary	Intestinal		
1,142	+ 75	1,217	37·2
Ancylostoma	... ... ...	1,076	32·8
Ascaris	... ... ...	731	22·3
Other parasites	... ... ...	350	10·6

N.B.—The number of infections differs from the number of patients as one patient may harbour more than one parasite.

Graph 3 shows the age and sex distribution of these parasitic infections.

TABLE VIII gives the Percentage and age Distribution (under and over 12 years) in both Sexes of these Parasitic Diseases :—

	Percentage infection of Bilhar- zia.	Percentage infection of Ancylo- stoma.	Percentage infection of Ascaris.	Percentage infection of other Parasites.
Females under 12 years—Total infections 397 ... ... ... ... ...	35·3	28·6	24·9	11·083
Females over 12 years—Total infections 760 ... ... ... ... ...	25·0	31·005	30·9	12·76
Males under 12 years—Total infections 635 ... ... ... ... ...	42·99	27·8	18·42	10·7
Males over 12 years—Total infections 1,672 ... ... ... ... ...	39·05	34·8	17·7	8·33

From tables VII and VIII and graph 3, the following conclusions may be drawn :—

(a) The most prevalent parasitic infections in the area are Bilharzia, Ancylostoma and Ascaris in the order mentioned.

(b) Urinary Bilharzia is commoner than the intestinal, the ratio being 15 to 1.

(c) Bilharzia infection is higher in males than females. This is probably due to the nature of their occupation ; males being more occupied in irrigation work than females (see Table VIII).

(d) Ancylostoma infection is almost the same among males and females in the ages above and below 12.

(e) Ascaris infection is commoner in females than males.

(4) *Laboratory Investigations.*

The laboratory routine work includes the following :—

(1) Blood examination for Malaria and other parasites.

(2) Microscopic examination of urine and faeces for parasites.

On the recommendation of Entomology Section, the following scheme of examining Malaria patients has been introduced at the Khanka Malaria Station :—

(1) Patients with Malaria only.

(2) Patients with Malaria and other parasites.

*Cases of Malaria only*

I.—*Clinical Investigations.*

(1) Detailed account of present attack.

(2) History of previous attacks.

(3) Clinical investigation (note specially spleen, liver, heart, etc., also any signs suggesting syphilis).

(4) Blood examination, this includes :

(a) Determination of species and stage of development of parasites.

(b) Differential blood count.

(c) Total number of parasites to leucocytes.

(d) Total R.B.C. count.

(e) Total W.B.C. count.

(f) Hæmoglobin estimation.

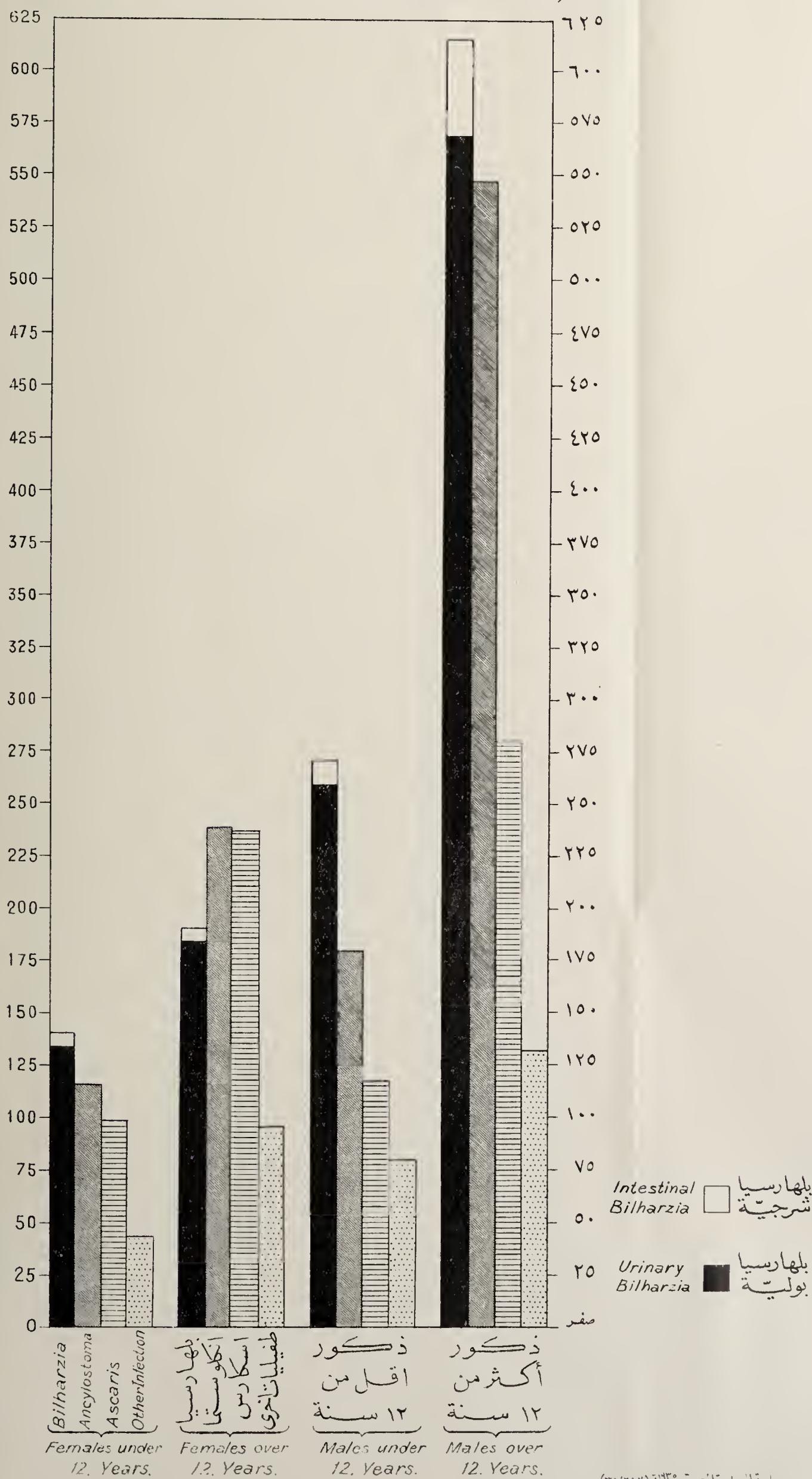
(f) C.I. (Colour Index).

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*Note.*—If Syphilis is suspected, a blood specimen is sent for Wassermann and no treatment given till result is known.

رسم بياني "٣" بأنواع الطفيلييات التي فحصت في لسنة ١٩٣٣  
في محطة أبحاث الملاريا موزعة حسب السن والنوع

GRAPH 3 SHOWING THE SEX AND AGE DISTRIBUTION  
OF PARASITIC DISEASES IN THE AREA FOR, 1933





## II.—Treatment.

One drug only should be used throughout the course of treatment:

(1) Blood examination every other day to determine rate of disappearance of parasites according to drug used.

(2) After four successive negative results, a complete blood picture (as shown in Sec. I, No. 4), is done.

If Anæmia is present, give an intensive course of iron for 4 weeks, then make a complete blood picture.

### *Cases of Malaria and Other Parasites*

(1) Treat Malaria following same steps as No. 1.

(2) Treat parasites—*Ancylostoma* or *Ascaris*, etc., first, and make a complete blood picture at end of course.

(3) If anæmia is present, give an intensive course of iron for 4 weeks, and then make a complete blood picture.

*N.B.*—In addition to their cards, a special record of the above findings should be kept separately.

In making thick films, it was deemed advisable to take as much as 10 drops of blood so as to reduce the number of missed cases where the parasites are scanty.

It is hoped that this scheme will enable one to analyse systematically the data obtained, *viz.* to determine primary and relapse cases, to find out the best drug to be used and to estimate the anæmia produced by the malarial and other parasites.

### MOSQUITO TECHNIQUE

The larvæ are brought to the Station or sent to the Research Institute for identification.

Some of the larvæ are mounted and the rest are bred out. In mounting larvæ, two methods have been adopted :—

(1) The larvæ are killed in hot water ( $80^{\circ}$  C.) and then mounted in De Faure liquid medium. This is a quick method and the slides can be stored for future reference.

(2) The larvæ are fixed in Carnoy solution, then passed through 80 per cent, 90 per cent and absolute alcohol. They are then cleared in cedar oil and mounted in Canada balsam. This method gives excellent results. The mounted specimen can be kept indefinitely and the internal anatomy can be studied without dissection.

## BREEDING OF MOSQUITOES

Moscon incubator for breeding mosquitoes has been found useful. Earthenware jars are very suitable during the hot season. As a control, the breeding of single larvae in test tubes was found extremely useful. This method enables one to determine exactly the duration of each larval instar and to experiment with the salinity and p.H. of the breeding media.

## MOSQUITO DISSECTION

Every Mulahiz was asked to collect adult mosquitoes from some tents, houses and stables in his area. 2,000 Anopheles mosquitoes were caught in this way, of these 350 were Anopheles multicolor and the rest were Anopheles pharoensis. The main places from which the mosquitoes were collected are as follows :—

- (1) Police tent at Princess Nimat Railway Station.
- (2) Workmen tent at Abou Zaabal.
- (3) Surveying tent at Aleg.
- (4) Old Taftish H.H. Princess Nimat.
- (5) House of Madbouli Salim at Ezbet el Brincessa.
- (6) Houses of Malaria patients attending the Station.
- (7) Tents and laboratory of the Khanka Malaria Research Station.

From the records of capture, it seems that mosquitoes have a preference for tents.

The alimentary canal and salivary glands were dissected out for malarial parasites in 450 Anopheles pharoensis and 150 Anopheles multicolor with negative results.

Some difficulties were found in collecting adult mosquitoes from houses, *viz.* :—

- (1) The habit of smoking in houses to dispel insects.
- (2) Most of the houses are built from mud, a colour from which it is difficult to distinguish mosquitoes. Mosquitoes used to take refuge in the thatched roofs of the houses.
- (3) Lack of experience among collectors.

A scheme is being worked out to improve the record of capture of adult mosquitoes.

### III.—*Field Survey.*

1. Malaria Survey of Siwa Oasis.
2. Mosquito Survey of Rice Fields in Lower Egypt.
3. Malaria Survey of Gabaris (Teh el Baroud).
4. Malaria Survey of some villages near Hehia.

#### (a) *Malaria Survey of Siwa Oasis.*

In January 1933, a Malaria Survey of the Siwa Oasis was undertaken. Results are published in a separate report.

In the springs of Siwa, Aghormy, Maragi, Gerba, Gara and Zeitoun, the following species of mosquito larvæ were found :—

##### (1) *Anophelini.*

1. Anopheles multicolor.
2. Anopheles superpictus.
3. Anopheles sergenti.
4. Anopheles algeriensis.

##### (2) *Culicini.*

###### 1. *Culex.*

- (a) Culex deserticola.
- (b) Culex pipiens.
- (c) Culex pusillus.

###### 2. *Aedes.*

- (a) Aedes caspius.
- (b) Aedes detritus.

###### 3. *Theobaldia.*

Theobaldia longiareolata.

The sketch maps attached to this report show the distribution of the various species at a glance.

In addition, the blood of 104 persons of the indigenous population of Siwa and Aghormy was examined and only three were positive for various species of Malaria.

The splenic index of 167 children examined was 4·2 per cent “It is apparent from these examinations that Malaria is not wide-spread in Siwa, if we compare it with the conditions prevailing before the work done by the Public Health Department to combat it.”<sup>(1)</sup>

(b) *Malaria Survey at Gabaris.*

As a result of a Malaria outbreak at Gabaris, 113 cases being notified in the week ending October 7, 1933, a mosquito survey of the area was undertaken from the 26th to the 28th October 1933, and a preliminary report was submitted.

The mosquito survey of the area showed the presence of the following larvæ mainly in the rice fields (see map 4) :—

1. Anopheles pharoensis.
2. Culex laurenti.
3. Culex pipiens.
4. Culex quasigelidus.
5. Culex peregrinus.
6. Aedes caspius.

Of the 537 blood films examined, only 27 were positive for Malaria; this being due to the fact that the inhabitants had a three weeks course of quinine before the survey was done.

37 Anopheles pharoensis collected from the cottages were dissected for the presence of Malaria parasites in the gut and salivary glands, and all were negative.

As the only Anopheles present in the area was Anopheles pharoensis, it is justifiable on epidemiological grounds to suspect it as a carrier of the disease. The increase of the Malaria incidence is probably due to the increase of the anopheline factor due to the increased rice cultivation in the area.

It is to be regretted that the survey was done when the Malaria outbreak was on the decline and the mosquitoes were on the decrease owing to the drying of most rice fields; thus a golden opportunity to identify the mosquito vector was lost.

(c) *Mosquito Survey of Rice Fields in Lower Egypt.*

On June 22nd and October 3rd 1933, a mosquito survey of rice fields was undertaken under the supervision of the Director. Each excursion lasted two days.

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<sup>(1)</sup> See report on the Mission of the Research Institute, P.H.D., and the Faculty of Medicine Cairo, to Siwa Oasis in January 1933, for the study of parasitic infections, Malaria and Diphtheria, by Dr. M. Khalil Bey, p. 6.





FIG. 6.—Small puddles teeming with *A. multicolor* in Edku.



FIG. 7.—Small puddles along the periphery of a salty swamp in Edku.  
Favourite breeding place of *Anopheles multicolor*.

The object of the survey was to determine the following :—

1. The mosquito fauna of rice fields and its seasonal distribution.
2. The effect of the salinity and p.H. of the water in rice fields and drains on the mosquito fauna.

Owing to the limited time at our disposal, it was deemed advisable to carry out the mosquito survey only.

129 rice fields were examined, mainly those in the close vicinity of towns and villages.

The larvæ present were as follows :—

1. Anopheles pharoensis found in 33 rice fields.
2. Anopheles multicolor found in a ditch near a rice field drain.
3. Culex laurenti found in 44 rice fields.
4. Culex quasigelidus found in 5 rice fields.
5. Culex tipuliformis found in 1 rice field.
6. Aedes caspius found in 1 rice field.
7. Aedes detritus found in 1 rice field.

The commonest associate of Anopheles pharoensis is Culex laurenti (found together 23 times). The absence of Culex perexiguus from the fields examined is remarkable as it is usually found in association with Anopheles pharoensis.

Map 5 shows the route taken and mosquito survey on the first tour on June 22, 1933.

Map 6 shows the route taken on the second tour on October 3, 1933.

Anopheles multicolor was found near Edkou. It was breeding in enormous numbers in small puddles of salty water on the edge of a big pond opposite the lake (see photographs 6 and 7). The pond itself was comparatively free and it is advisable to fill or connect these puddles with the main pond.

A detailed report will be submitted later.

#### (d) *Malaria Survey in some Villages near Hehia.*

A Malaria survey of Kafr Aguiba, Kafr Ghorab, Ezbat el Nagagra, el Zarzamoun and Ezbat el Zaafaranah, was undertaken in September 1933. A detailed report will be submitted.

Of special interest is the Malaria survey of Ezbat el Nagagra in the Taftish of Sobeih near Zarzamoun. Owing to the pressure of Malaria work then, one day was devoted for this survey.

This Ezbeh was selected on account of its isolation from neighbouring villages, the small number of its inhabitants and its situation in the middle of the Rice Fields.

The Ezbeh (see sketch map No. 7) consists of 22 houses, of which houses No. 5 and 17 were empty and house No. 16 was used as a mill. Most of the houses consisted of two rooms with an entrance hall which was used as animal shed. They were built of mud and were poorly ventilated. The total number of inhabitants were 75 persons.

The mosquito survey was done in the morning and it included the inspection of all breeding places at a radius of 3 kilometres, taking the Ezbeh as a centre.

The following mosquito larvæ were found (see map 7) :—

1. *Anopheles pharoensis*.
2. *Culex laurenti*.
3. *Culex pipiens*.

In the evening when all the inhabitants returned to the Ezbeh, thick and thin blood films were taken. In addition, a splenic and oriental sore survey were done. Four *Anopheles pharoensis* were caught—three from the houses and one was found feeding on the arm of one of the surveyors. The latter was allowed to complete its meal in the hope that if it was infected, Malaria would have developed. After two days, the mosquitoes were dissected with negative results for Malarial parasites.

The blood examination showed the following :—

Persons examined for Malaria ...	... ... ...	75
Persons harbouring benign tertian parasites ...	15	— 20%
Persons harbouring malignant tertian parasites ...	16	— 21%
Total number having B.T. and M.T. Malarias ...	31	— 41·3%

The house distribution of Malaria cases (see sketch map 7) is as follows :—

1. Houses Nos. 1, 6, 11, 12, 14, 18, 19 and 22 were free from Malaria.
2. Houses Nos. 4, 8, 10 and 15 had 4 to 5 Malaria cases.
3. Houses Nos. 9 and 13 had 3 cases each.
4. Houses Nos. 2, 3, 7, 20 and 21 had one or two cases each.

The house distribution of Malaria cases is probably best explained on the basis of crowding and age susceptibility to the disease.

The blood examination showed the following :—

The following table gives the age and kind of Malaria of the persons affected :—

No.	Name	Age	Species of Malaria Parasite	No.	Name	Age	Species of Malaria Parasite
1	Salem Mohammed ...	22	B.T.	18	Mohammed Ibrahim		
2	Abdalla Salem Mohd.	15	B.T.		Ramadan ... ...	19	M.T.
3	Fatma Ahmed Salim	12	B.T.	19	Ali Ibrahim Ramadan	14	M.T.
4	Mohammed Ahmed Selim ... ...	8	B.T.	20	El Sayed Ibrahim		
5	Abdel Hamid Abou Ibrahim ... ...	12	M.T.	21	Hassan Ibrahim Ramadan ... ...	4	M.T.
6	Aziza Ibrahim ... ...	19	M.T.	22	Fatma Ibrahim Ramadan	2	M.T.
7	El Zein Ibrahim ...	10	B.T.	23	Mousa Mohammed el Shaer ... ...	23	M.T.
8	Sekina Ibrahim ...	8	B.T.	24	Fatma Ahmed Sabei ...	2	B.T.
9	Amina Ibrahim ...	6	B.T.	25	Nefisa Mohammed		
10	Ali Mohammed Ali ...	3	B.T.	26	Mohammed ... ...	20	M.T.
11	Amna Eisa ... ...	12	B.T.		Selim Abdel Nabi ...	40	M.T.
12	Fatma Mohammed Eisa ... ...	10	M.T.	27	Mohammed Selim		
13	El Sit Mohammed Eisa	8	B.T.		Abdel Nabi ... ...	15	M.T.
14	Zeinab Om Shehata ...	30	M.T.	28	Nafisa Selim Abdel		
15	Kamal Ali Abdel Rehim ... ...	12	M.T.	29	Nabi ... ...	10	M.T.
16	El Sayed Ali Abdel Rehim ... ...	4	B.T.	30	Sabeha Abdel Rehim	70	M.T.
17	Amina A. Abdel Rehim ... ...	5	B.T.	31	Awatef Ali Soliman ...	13	B.T.
					Zakia Mohammed Mansouri ... ...	12	B.T.

The following table gives the age distribution of Benign and Malignant Malaria :—

Age	B.T.	M.T.	Total of B.T. and M.T.	Percentage out of 75 examined
1-10 ... ...	9	5	14	18·7
11-20 ... ...	5	6	11	14·7
21-30 ... ...	1	3	4	5·3
Over 30 ... ...	—	2	2	2·6

*Conclusion :—*

From this survey, one may conclude (with some reserve owing to the small number examined) the following :—

- (1) The only Anopheline found is *Anopheles pharoensis*.
- (2) The increase of Malaria incidence (41 per cent of population are infected) is due to the increase of Anopheline factor, *viz.* *Anopheles pharoensis*. This increase was brought about by the introduction of Rice cultivation in 1933. The inhabitants themselves are aware of the fact that mosquitoes and fever increased since the Rice cultivation was introduced.
- (3) From a study of the age distribution of the disease (see table), it is clear that the main brunt of the disease fell on children from 1 to 10 years of age. This is suggestive of fresh infection with Malaria among children and is supported by a study of the splenic index and history given.
- (4) The study of the house distribution of Malaria cases can be best explained on the basis of crowding and age susceptibility to the disease.

As no data are available on the Malaria conditions in the Ezbeh prior to Rice cultivation, one is tempted to conceive the course of the Malaria epidemic in 1933 as follows :—

That Malaria was present in chronic form among the men prior to Rice cultivation and that the recent epidemic which mainly affected the children has been brought about by the increased Anopheline factor.

At any rate, it is highly desirable in the future to undertake Malaria surveys in small villages prior to and after Rice cultivation.

*IV.—Research Problems under Investigation*

The following problems are still under investigation :—

- (1) The mechanism of Ecdysis (shedding of the skin) in some dipterous larvæ.
- (2) Biology and morphology of all the stages of *Anopheles pharoensis* with notes on its egg laying power.

*Ecdysis.*

Ecdysis is common to all insects. The phenomenon is being studied in Scatopsid, Rhyphid, Mycetophilid and Culicine larvæ. In this connection, the respiratory system of these larvæ is investigated. In Culicines, the application of larvicide such as oiling, will be studied to determine the mode of action.

*Anopheles pharoensis.*

This mosquito is often caught from houses. A detailed study of the biology and morphology is undertaken. Adult mature females were introduced singly in breeding cages and left to lay their eggs. The experiment was carried on 50 females and the average number of eggs laid per female was 124.



Sketch Map :- No. " 1 "

— १० —





Sketch Map:- No: "2.

سمكوى - نمرة " ٢ "



1. (P) *A. pharaonis*.
  2. (M) *A. multicolor*.
  3. (W) *Culex pusillus*.
  4. (S) *" taticinctus*.
  5. (Q) *" quasigelidus*.
  6. (P) *" peregrinus*.
  7. (L) *" laurentii*.
  8. (A) *" pipiens*.
  9. (X) *Theobaldia longiareolata*.
  10. (+) *Uranotaenia unguiculata*.
  11. (E) *Aedes caspius*.
- د. أونقلي . فرعوني  
٢. م. متعدد الألوان  
٣. كوكن . يوسيلاس  
٤. لاقستكت من  
٥. كواجيليدس  
٦. بوكسيجيونس  
٧. لورنتي  
٨. بيدانز  
٩. ثيوبلوديا  
١٠. يورانتنيا  
١١. ايدس . كاسبيس



Sketch Map:- No. 3.

# کفر سندوہ

KAFR. SINDEWAH

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

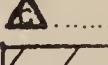




Sketch Map:- No: "4<sup>no</sup>

سکوکی :- نمرة " ۴ "

Notes:-

- |  |                              |                    |
|--|------------------------------|--------------------|
| (P) .....  | <i>A. pharaonis</i> .        | النفيلي . فرعوني   |
| (Q) .....  | <i>Culex quasigibbosus</i> . | كونكس . كواسيجبيوس |
| (P) .....  | " <i>peregrinus</i> .        | " بركسجيوس         |
| (L) .....  | " <i>laurenti</i> .          | لوشناتي ~          |
| (P) .....  | " <i>pipiens</i> .           | بيانز ~            |
| (A) .....  | <i>Aedes caspius</i> .       | ايدس كاسبيس ~      |
|  ..... | <i>Rice fields</i> .         | منطقة زراعة الارز  |





Sketch Map :- No. 5.

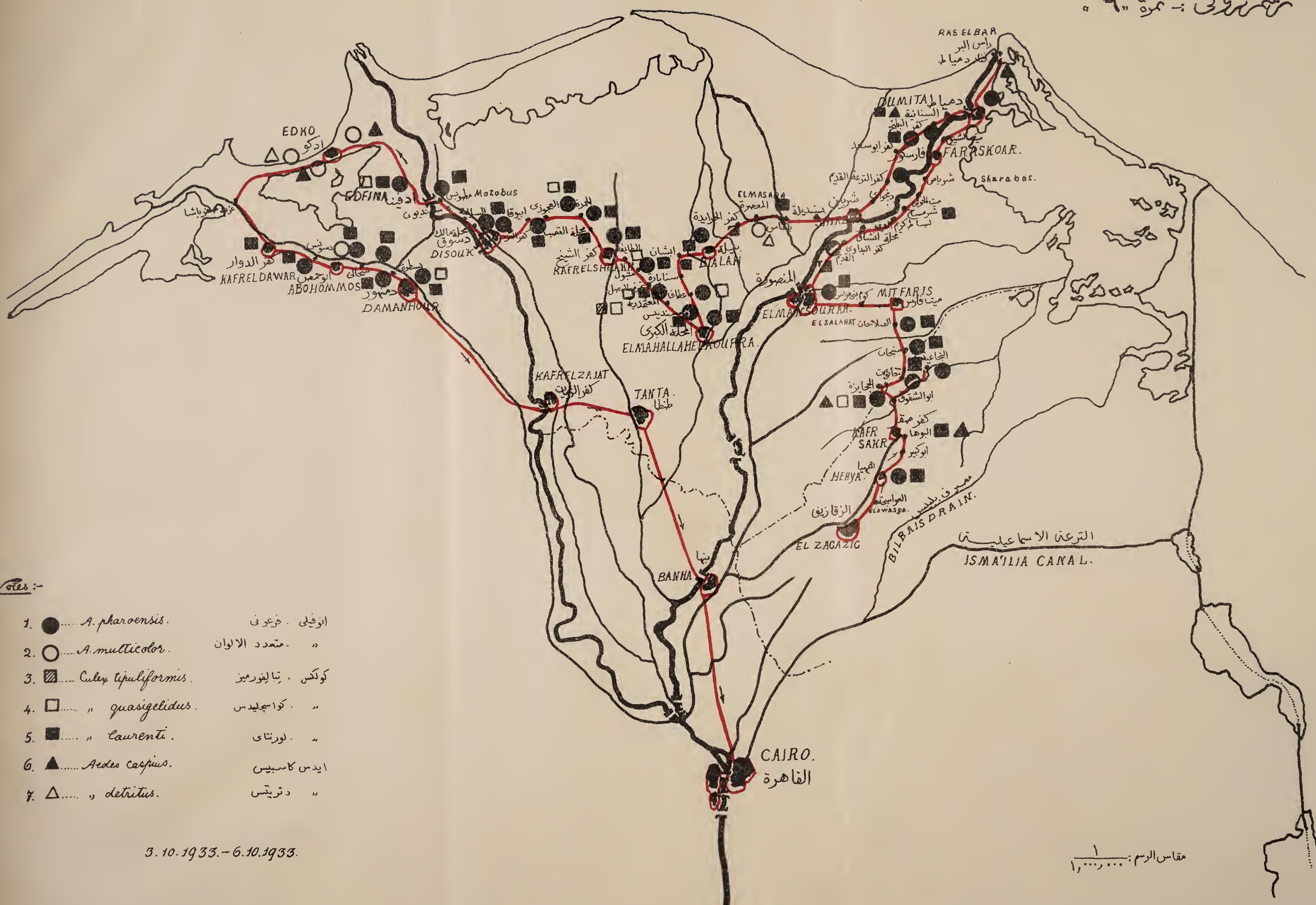
« سكروكى :- نمرة » ٥





Sketch Map: No. 6.

رسنگوکی :- نمره " ۶ "









## PART II.

### CLINICAL REPORT

#### 1.—The Result of the Work of the Out-Patient Clinic.

##### (a) *Admission of Cases* :—

The outpatient clinic is intended mainly for the treatment of helminthic infections and some of their frequent complications.

All individuals who present themselves are asked as a routine to submit a specimen of urine and another of faeces for microscopic examination. Clinical examination of all new cases is carried out. Blood examination as well as other investigations are done to some cases if indicated.

About 25·5 per cent of the new patients were found free from helminthic infections.

The number of patients applying daily for examination and treatment is far beyond the capacity of the staff to deal with properly. Hence, the admission of the new cases is limited to 45 daily.

##### (b) *Incidence of Parasitic Infections* :—

The total number of new cases dealt with during the year 1933 was 12,948. The microscopic examination of their urine and stools revealed the following :

	Number of cases	Percentage
Total number whose urine was examined ... ...	12,804	98·88
Schistosoma hæmatobium ova in urine ... ...	6,877	53·71
Schistosoma mansoni ova in urine ... ...	21	0·164
Total number whose stools were examined ... ...	12,608	97·37
Schistosoma hæmatobium ova in stools ... ...	161	1·276
Schistosoma mansoni ova in stools ... ...	239	1·89
Ancylostoma duodenale ova ... ... ...	3,489	27·67
Ascaris lumbricoides ova ... ... ...	1,878	14·89
Taenia saginata ova ... ... ...	152	1·20
Enterobius vermicularis ova ... ... ...	984	7·8
Trichostrongylus ova ... ... ...	1,829	14·5
Hymenolepis nana ova ... ... ...	859	6·81
Trichocephalus trichuris ova ... ... ...	148	1·17
Strongyloides stercoralis larvæ ... ... ...	15	0·19
Total number of cases negative for helminthic ova.	3,302	26·18

The stools are examined by the smear method and also by Khalil's Erlenmeyer flask Flootation method. The swab method is used in doubtful negative cases.

(c) *Schistosoma Treatment* :— .

Fouadin was the drug used for the routine treatment of Schistosomiasis. The dose is given in proportion to the weight of the patient.

Fouadin calcium was tried in a number of cases ; the results will be discussed later.

A number of cases received daily injections of Fouadin and the results will be published later.

Microscopic examination of the excreta is made after the ninth injection and, if necessary, more injections are given. Examination is repeated after every two additional injections.

Out of a total of 6,877 cases infected with Schistosomiasis, 1,583 did not receive any treatment at all, owing mainly to absenting themselves ; 2,000 cases did not complete the course of injections. This is practically about 29 per cent of the total number of cases.

The patients stop the treatment apparently for the slightest reason arising in their private affairs, or when cessation of pain during micturition occurs, or when the passage of blood in the urine stops during the course of treatment in the belief that they are cured.

*The Immediate Results of Fouadin Treatment* :

	Number of Cases	Percentage
Number of cases who completed the course of 9 injections	3,302	—
Number of cases cured	2,741	83·00
Number cured after 9 injections	2,094	63·41
Number cured after 11 injections	503	15·23
Number cured after 13 injections	144	4·36
Number of cases who did not continue the additional injections	538	16·29
Number of cases still positive after 13 injections	23	—

Re-examination of excreta one month after the end of treatment was possible in 480 cases. The result was that 418 were cured and 62 were positive again, i.e. 87·08 per cent were cured.

Re-examination 3 months after the end of treatment was possible in 89 cases. 74 were cured and 15 were positive again (either a relapse or a new infection).

It was observed that Schistosomiasis of the urinary tract is more susceptible to treatment than intestinal infection.

*Symptoms developing during the treatment :*

Among 5,294 cases who received Fouadin injections, the following symptoms were observed :

- (1) *Nausea* : occurred in 6 cases (0·11 per cent).
  - (2) *Vomiting* : occurred in 70 cases (1·32 per cent). This symptom was more frequent during later injections.
  - (3) *Giddiness* : occurred in 81 cases (1·53 per cent). This symptom was more frequent after the fifth injection.
  - (4) *Rise of temperature* : occurred in 27 cases. In some of them, it may be due to some intercurrent disease.
  - (5) *Skin rashes* :
    - 5 cases developed pyodermia.
    - 2 cases developed herpes zoster.
    - 4 cases developed urticaria.
  - (6) *Fainting* : occurred in 5 patients. In 3 of them, it occurred after the first injection, and in the other two, after later injections.
  - (7) *Rheumatic pains* : occurred in 5 cases.
  - (8) *Colicky pains (intestinal)* : occurred in 10 cases.
  - (9) *Renal colic* : occurred in 4 cases, but the patients gave history of previous attacks.
  - (10) *Cough* : occurred in 11 cases.
  - (11) *Headache* : occurred in 13 cases.
  - (12) *Diarrhoea* : occurred in 3 cases. Amoebic and bacillary dysenteries were excluded.
  - (13) *Tachycardia* : was observed in 3 cases.
  - (14) *Inflammation* : at site of injection :
    - 30 cases developed induration at site of injection which resolved by the application of hot fomentations.
    - 11 cases developed abscess at site of injection which was opened and patients were cured.
- (d) *Treatment of Pyelitis and Cystitis (Post Bilharzial) :—*

Patients complaining of cystitis and whose urines contain a lot of pus were given a course of Cylotropin injections. Six intravenous injections or more, of 5 c.c. each, were given in each case.

15 cases with severe cystitis were thus treated. Their condition usually improves after the course and the urine gets clearer. Many of these cases relapse after finishing the course, and a second, and in some cases a third course is necessary to relieve the condition.

Some cases of severe pyelitis are very obstinate to such treatment and improve only after a course of 30 to 40 intravenous injections of cylotropin.

Mist. Buchu and Hyoscyamus was given to patients complaining of painful micturition which persisted after finishing the Fouadin course ; and was followed in some cases with marked relief.

(e) *Treatment of Renal Colic.*

Renal colic is sometimes complained of in the outpatient and in most cases it is a post bilharzial condition. Intravenous injections of calcium chloride was tried in about 100 attacks, and was accompanied by marked relief in some cases. In other cases, it failed to act. The drug is still under trial in such cases.

(f) *The Incidence of Lesions of the two Species of Schistosoma in the Urinary and Intestinal Tract :—*

Among the 6,877 cases infected with Schistosomiasis of both urinary and intestinal tracts, the following was observed :

	Number of Cases	Percentage
Total number of Schistosomiasis cases ... ...	6,877	—
Schistosoma haematobium ova in urine only with stools free ... ... ... ... ...	6,474	94·14
Schistosoma haematobium ova in urine and stools ... ... ... ... ...	137	1·99
Schistosoma haematobium ova in urine and Schistosoma mansoni in stools... ...	123	1·78
Schistosoma haematobium and Schistosoma mansoni in both urine and stools ... ...	—	—
Schistosoma mansoni ova in stools only ...	98	1·42
Schistosoma mansoni ova in urine and stools	2	0·03
Schistosoma haematobium ova in stools only.	24	0·349
Schistosoma mansoni ova in urine only, with stools free ... ... ... ... ...	4	0·06
Schistosoma haematobium and Schistosoma mansoni ova in urine only with stools free	15	0·218
Schistosoma mansoni ova in urine and stools and Schistosoma haematobium ova in urine ... ... ... ... ...	—	—

(g) *Treatment of Ankylostomiasis* :—

Carbon tetrachloride was used in the treatment of pure Ancylostoma infection. The purity of the drug was ascertained in addition to the ordinary chemical tests by a biological test.

5 c.c. is the adult dose which is given mixed with a saline purge (mag. sulphate). 60 kilos is considered the standard adult weight and doses are given in proportion to the weight of the patient.

If the bowels do not move after two hours from the administration of the drug, an enema is administered.

Re-examination is done after one week, and the drug is repeated in positive cases.

Patients suffering from both Schistosomiasis and Ankylostomiasis are treated with Carbon tetrachloride before they are submitted to the Fouadin treatment.

Patients harbouring both Ancylostoma and Ascaris are given a mixture of Carbon tetrachloride 2·25 c.c. and Oil of Chenopodium 2·25 c.c.

1,330 cases were given Carbon tetrachloride only, but did not present themselves after one week.

Out of 1,029 cases who were re-examined after the first treatment 587 cases (58 per cent) were cured.

Out of 164 cases who received two treatments and were re-examined, 121 cases (73·77 per cent) were cured.

Out of 43 cases who received three treatments and were re-examined, 40 cases (93·0 per cent) were cured.

Out of the 3 cases who received 4 treatments and were re-examined, all (100 per cent) were cured.

*Remote results of the Treatment* :

182 cases presented themselves for re-examination one month after their treatment. 152 cases were found to be still negative, i.e. 83·1 per cent. 15 cases presented themselves for re-examination after more than one month and all of them were free from Ancylostoma infection.

*Symptoms appearing during Treatment* :

- (1) *Giddiness* : was reported in 25 cases. This is usually relieved by a soap enema and some stimulants.
- (2) *Vomiting* : was noticed after the drug was taken in 15 cases.
- (3) *Fainting* : was noticed 9 cases ; patients were semi-conscious and were treated by soap enemas and cardiac stimulants.

(h) *Treatment with a mixture of Carbon tetrachloride and Oil of Chenopodium :—*

Equal parts of Oil of Chenopodium and Carbon tetrachloride were given as a mixture in cases of infection with Ancylostoma and Ascaris. The dose given was 4·5 c.c. to an adult. After-treatment was the same as described under Carbon tetrachloride.

Out of 366 cases given the mixture, 178 (48·63 per cent) were found on re-examination to be free from both parasites, while 188 cases were cured from Ascaris but still passing Ancylostoma ova, i.e. 51·37 per cent.

(i) *Treatment of Ascaris with Oil of Chenopodium :—*

Oil of Chenopodium in doses of 3 c.c. for an adult was given for the treatment of Ascaris infection.

474 cases were treated; all of them proved to be negative after one treatment.

The drug is mixed with castor oil before being given to the patient.

(j) *Treatment of Ascaris with Ascaridol :—*

Ascaridol was given in doses of 1·25 c.c. with castor oil to 69 cases with Ascaris infection. All of them were cured after one treatment.

(k) *Taenia saginata :—*

Among the 12,608 cases examined, 152 were found infected with *Taenia saginata*. Out of these 109 cases could not be treated because of lack of the fresh extract of Felix mas.

Out of the 43 cases treated with the available drug, 12 cases passed the worm with the head. 25 cases did not present themselves after the first dose of the drug. 6 cases were re-examined and found positive after the first treatment.

Because of the difficulty of having a fresh extract always ready, the Institute arranged to get the plant directly from Switzerland, where it grows abundantly, and extract it locally.

(l) *Enterobius vermicularis* :—

This is rather a difficult parasite to treat owing to self-infection (autoinfection) and the lack of cleanliness among the patients. Carbon tetrachloride was found efficacious in expelling a large number of the worms. It is not certain if it can cure the cases.

267 cases were given Carbon tetrachloride. 178 cases proved to be negative after the first dose. 89 cases were still positive.

Mercury ointment and highly concentrated saline enemas were advised and proved to be of some benefit.

Among 12,608 cases examined, 267 cases were found infected with Enterobius only. 717 cases were harbouring Enterobius and other parasites.

(m) *Hymenolepis nana* :—

Various drugs were tried during this year in the treatment of this parasite.

181 cases were given extract of Felix mas, 55 of which did not present themselves for re-examination after treatment.

Of the 126 cases which were re-examined, 72 cases proved to be negative, i.e. 57·1 per cent, while 54 cases were positive. It is to be noted here that the extract was not very fresh.

77 cases were given Carbon tetrachloride. 24 of them did not present themselves for re-examination.

Of the 53 cases which were re-examined, 26 were negative, i.e. about 50 per cent and 27 were still positive.

15 cases were given Oil of Chenopodium, 6 of which did not present themselves for re-examination.

Of the 9 cases which were examined, 8 cases were negative, i.e. 77·7 per cent and one case was positive.

(n) *Trichostrongylus* :—

40 cases were given extract of Felix mas, 4 of which did not present themselves for re-examination.

Of the 36 cases which were re-examined, 26 cases were negative, i.e. 72·2 per cent, and 10 cases were positive.

280 cases were given Carbon tetrachloride. 200 cases did not present themselves for re-examination.

Of the 80 cases which were re-examined, 45 cases were negative, i.e. 56·2 per cent, while 35 cases were positive.

Various other drugs are still under trial and the results will be published later.

## Statistics of the Work done in the Hospital

NUMBER OF NEW PATIENTS DURING 1933 PER MONTH.

Month	Females under 12 years	Females over 12 years	Males under 12 years	Males over 12 years	Total
January ... ... ... ... ...	37	147	61	368	613
February ... ... ... ... ...	63	276	98	655	1,092
March ... ... ... ... ...	88	303	127	548	1,066
April ... ... ... ... ...	48	263	85	444	840
May ... ... ... ... ...	99	298	127	693	1,217
June ... ... ... ... ...	72	227	111	715	1,125
July ... ... ... ... ...	66	254	140	710	1,170
August ... ... ... ... ...	100	322	177	727	1,266
September ... ... ... ... ...	116	474	122	787	1,499
October ... ... ... ... ...	95	316	107	612	1,130
November ... ... ... ... ...	84	262	112	674	1,132
December ... ... ... ... ...	61	176	76	480	793
TOTAL ... ... ...	929	3,318	1,283	7,413	12,512

TABLE VI.—NUMBER OF TREATMENTS OF PATIENTS DURING 1933 PER MONTH.

Month	Fouadin Injections for Bilharzia	Doses of Carbon tetrachloride for Ancylostoma and Enterobius	Doses of Oil of Chenopodium or Ascaridol for Ascaris			Doses of Carbon tetrachloride and Oil of Chenopodium for Ancylostoma and Ascaris			Doses of Felix mas. for Taenia saginata			Emetine Injections for Amoebic Dysentery			Injections of Cytotropin for Post Bilharzial Cystitis			
			New Cases	Old Cases	Total	New Cases	Old Cases	Total	New Cases	Old Cases	Total	New Cases	Old Cases	Total	New Cases	Old Cases	Total	
January	198	1,557	1,755	121	37	158	63	1	64	—	—	7	15	—	—	—	4	
February	379	2,046	2,425	182	26	208	103	1	104	—	—	—	—	—	—	—	—	
March	489	3,412	3,901	278	61	339	178	2	160	—	—	—	—	—	—	—	—	
April	291	1,902	2,193	220	49	269	117	6	123	—	—	—	—	—	—	—	—	
May	552	3,479	4,031	284	70	354	98	3	101	41	—	13	1	13	14	21	—	
June	583	3,899	4,482	253	75	328	69	3	72	53	10	4	14	2	19	21	—	
July	515	3,926	4,441	299	70	369	56	3	59	47	10	2	12	3	38	41	—	
August	556	3,727	4,283	327	71	398	97	1	98	100	1	12	2	14	4	27	31	
September	632	4,396	5,028	264	69	333	90	1	91	93	2	4	2	6	10	49	59	
October	430	3,246	3,676	169	89	258	85	1	86	51	—	—	—	—	3	30	33	
November	482	3,456	3,938	178	86	264	85	1	86	65	1	55	—	—	5	29	34	
December	307	2,452	2,759	176	69	245	57	1	58	—	—	—	—	—	1	14	15	
Total	5414	37,498	42,912	2751	772	3523	1098	24	1122	505	4	509	80	18	98	31	220	251

TABLE VII.—RESULTS OF MICROSCOPIC EXAMINATION AFTER TREATMENT.

MONTH.	BILHARZIASIS						ANKYLOSTOMIASIS.					
	Number Examined.	Negative after 9 Injections.	Negative after 11 Injections.	Positive after 9 Injections.	Positive after 11 Injections.	Positive after more than 11 Injections.	Number Examined.	Negative.	Positive.	Number Examined.	Negative.	Positive.
January	...	...	...	...	...	...	110	56	4	106	65	41
February	...	...	...	...	...	...	395	233	12	84	47	37
March	...	...	...	...	...	...	201	162	6	138	71	67
April	...	...	...	...	...	...	188	108	9	121	74	47
May	...	...	...	...	...	...	371	243	18	236	160	126
June	...	...	...	...	...	...	361	181	51	202	115	87
July	...	...	...	...	...	...	357	239	78	19	137	87
August	...	...	...	...	...	...	362	211	8	224	9	55
September	...	...	...	...	...	...	368	218	11	214	119	95
October	...	...	...	...	...	...	285	141	18	278	176	102
November	...	...	...	...	...	...	305	174	20	235	132	103
December	...	...	...	...	...	...	208	124	58	3	195	83
									7	4	162	93
TOTAL	...	...	...	3,511	2,090	503	144	607	14	23	2,245	1,248
												997

## 2.—The Hospital In-Patients.

### CLINICAL INVESTIGATIONS DURING 1933.

#### *Introduction.*

Clinical investigations are mainly carried out on hospital in-patients as they need prolonged study of the cases, clinical, laboratory and instrumental examinations, as well as repeated observations and therapeutic studies. Such procedure could not be easily achieved on the out-patients owing to interruption and even loss of many cases resulting from delay in attendance. Nevertheless, certain investigations of statistical nature or drug trials are also carried out in the out-patient department either independent or in connection with problems investigated in the in-patients at the same time.

The completeness of the hospital staff during this year has shown its great advantages in obtaining more carefully controlled data about the cases, notes and progressive observations as well as more production of work both in the wards and in the out-patient department.

A new card has been devised for the new patients ; and with the availability of the staff, the data could be completed for every patient. This thorough clinical, parasitological and sometimes haematological, biochemical, serological and instrumental investigations of new patients has enabled us to detect cases of problematic interest for further studies and to have more accurate analysis of cases.

Most accepted methods of investigation utilisable in diagnosis are carried out when indicated. Attempts are being made to equip the Institute and Hospital with every modern apparatus necessary for these purposes. Shortage of certain apparatus was temporarily overcome by communicating with other hospitals (mainly Kasr el Aini Hospital) to achieve complete investigation so as not to lose cases of importance.

Cases are selected from the out-patient for admission or transferred from other hospitals or sent by doctors for investigation and advice. Total number of admissions was 249. Their division into disease groups will be seen in the subsequent discussion. The number of beds available is 20. The average stay of a patient is one month.

#### A.—ANÆMIAS.

Investigations on Anæmia in Egypt are being continued. Cases met with in the out-patient are submitted to the following examinations:—

(1) *Clinical Examination.*—To exclude organic cause or associated disease that may have participated in the causation of Anaemia, e.g. Tuberculosis, Cancer, etc.

(2) *Blood Examination.*—Preliminary haemoglobin estimation is done in the out-patient to determine degree of anaemia. Further detailed haematological studies are carried out in the cases found to be worth study.

(3) *Gastric Analysis.*—For certain reasons which will be mentioned later, achlorhydria was looked for in these cases to separate and investigate more fully the group of Anaemia with achlorhydria. For the detection of achlorhydria and determination of its nature, false or true achlorhydria or achylia gastrica, the alcohol meal (Ehrmann) was utilised, combined with histamine if necessary.

(4) *Examination for parasites* in the urine and faeces, a film of blood is stained with Wrights stain and examined to exclude malarial parasites specially in suspicious cases (history of rigors or enlarged spleen).

Wrights stain has proved in our hands to be very suitable for out-patient work as it is efficient as a differential stain, easy to be carried out by laboratory assistants and very quick (three minutes) so that the film can be ready during the clinical examination of the patient.

These procedures are carried out in the out-patient department for cases of Anaemia and have enabled us to classify the various types of Anaemias common in Egypt (in the hospital class of people).

Further observations on the biochemical aspects, therapy, etc., in such cases are done in the wards.

#### *Analysis of Cases Studied:—*

317 cases of Anaemia have been subjected to these examinations during this year.

#### I.—HELMINTHIC ANAEMIA.

This group constitutes the most frequent type of Anaemia met with in our hospital class of patients, and for this reason will be discussed more fully.

### 1.—*Role of Different Parasites in the Production of Anaemia.*

For this study, only pure single infections are suitable. Cases were examined and the following shows the incidence of Anaemia in each parasitic infection.

#### *Severe Anaemia :—*

Ancylostoma duodenale.

Intestinal Schistosomiasis.

Diphyllobothrium latum infection is a cause of severe Anaemia which may acquire a pernicious-like blood picture, but luckily it is absent from Egypt.

#### *Moderate Anaemia :—*

Ascariasis.

Urinary Schistosomiasis, especially if associated with repeated haematuria or sepsis of the urinary tract.

#### *Slight or no Anaemia :—*

Heterophyes heterophyes infection.

Hymenolepis nana.

Taenia saginata.

Filariasis.

It is seen that Ankylostomiasis and Intestinal Schistosomiasis are the most important causes of severe Anæmia in this group. The mechanism of production of Anæmia in these cases, as well as certain peculiar clinical and biochemical features, will be discussed with each respectively.

### 2.—*Haematological Picture.*

Helminthic Anæmias of various causations possess many haematological features in common, with only some small variations which will be discussed separately.

The technique and methods of haematological investigations done in these cases are mentioned in the previous report. It is to be mentioned that unless the methods used are constant and reliable, wrong interpretations are made. For this reason, it was our aim all through to standardise our technique of haematological studies as well as to assure its accuracy. Certain new modifications were added during this year (see report of section of experimental Pathology and Medicine).

Now the haematological findings in helminthic anaemia will be discussed :—

(a) *Hæmoglobin Reduction.*

Marked hypochromia is a constant feature of these cases ; figures of 15 to 20 per cent are common, while a case with hæmoglobin as low as 8 per cent has been found.

(b) *Red Blood Corpuscles.*

(i) *Number.*—In contrast with the marked hypochromia, the number of the R.B.C. is only moderately decreased so that the colour index is always markedly below one ; usually about 0.5. In no cases in our series of helminthic anaemias, hyperchromia has ever been demonstrated.

(ii) *Size.*—*Microcytosis* is common in severe chronic cases, while

(iii) *Poikilocytosis* is of frequent occurrence, and specially marked in severe cases.

(iv) *Reticulocytes.*—Number is always below 1 per cent in the chronic uncomplicated cases ; they rarely exceed 2 per cent in cases of acute *Ancylostoma* anaemia. Higher figures should arouse the suspicion of a complicating factor (haemorrhage, malaria, syphilis etc.).

*Nucleated forms* are extremely uncommon except in acute *Ancylostoma* cases with heavy infection and short duration. They are always of the normoblastic variety, no megaloblasts have ever been met with in our series.

(c) *White Blood Corpuscles.*

(i) *Total Count* showed a tendency to leucocytosis (11,000-12,000) in acute *Ancylostoma* anaemia. A normal or slightly diminished total count is the usual finding in chronic cases.

(ii) *Differential Count.*—Eosinophilia, neutropenia and occasionally lymphocytosis are the usual finding in chronic cases.

The degree of eosinophilia depends more on the stage of the disease and constitution of the patient than the degree of infection. Its significance is manifold in these cases :—

Of diagnostic value in the absence of other etiological factors.

Prognostic value : cases showing marked eosinophilia recover quicker on treatment. Low eosinophilic count in a severe case is taken as a bad prognostic sign. In our opinion this is only true if other factors depressing the eosinophils temporarily are excluded.

Eosinophilic rise after treatment, as reticulocytic crises, is indicative of a good response.

From the previous studies, the haematological picture common to various helminthic anaemias can be formulated as follows :—

Markedly Hypochromic, Micro or Normocytic, Non-Hæmolytic, Hypoplastic Anæmia with Eosinophilia.

### 3.—*Investigations on the Blood Chemistry.*

The blood chemistry of pure *Ancylostoma* cases will be published separately when sufficient data are available.

The following biochemical changes in the blood of cases of helminthic anaemias of various, single and mixed causation have been found. (This work has been done in collaboration of the Biochemical Section).

(a) *Icterus Index*.—Constantly within normal limits in both acute and chronic cases. Any increase suggests an additional factor (hæmolytic or hepatic). This is an indication of absence of haemolysis as a factor in the causation of these anaemias.

(b) *Plasma Proteins*.—Normal in some cases and diminished in others especially in those associated with oedema. The reduction affects mainly the albumen fraction.

(c) *Non-Protein Nitrogen*.—No increase in blood urea, uric acid or total non-protein nitrogen has been found in such cases even those complicated by oedema.

(d) *Blood-Cholesterol*.—Was estimated by Meyer's technique and found to be constantly low (56 mgrms. found in one case). This reduction bears a rough relationship to the degree of anaemia. It is also low in cases with oedema suggesting its non-nephrotic nature.

(e) *Chlorides* of whole blood (Vollard) have shown increase in most of the cases. Plasma chlorides, estimated in few cases, showed no deviation from normal values.

(f) *Serum Calcium*.—Was found to vary, sometimes normal figures, sometimes lower figures were found.

#### 4.—Investigation of Certain Clinical Manifestations.

Clinical studies of cases of helminthic anaemias have shown certain manifestations worthy of comment. Other peculiar clinical features to pure infections will be mentioned under their corresponding headings :—

(a) *Gastric functions in Helminthic Infections*.—(Completed in collaboration with the Biochemical Section and published in the Journal of the Egyptian Medical Association).

(b) *Oedema in Helminthic Anaemia*.—The occurrence of oedema in helminthic anaemia is not uncommon. The association is variable suggesting more than one factor. For this reason 22 cases have been subjected to clinical and biochemical observations as well as to the effect of various dietetic and therapeutic measures.

Details of this work are under publication elsewhere, the main findings are summarised here.

(i) Although all cases showing oedema were markedly anaemic (H.B. below 50 per cent), yet there is no relation between the occurrence of the oedema and the degree of the anæmia, suggesting the presence of additional factors other than the anæmia in its production.

(ii) Circulatory factor has been demonstrated in three cases.

(iii) Non-Renal nature of the oedema in these cases has been proved.

(iv) Hypo-proteinæmia was demonstrated in 11 out of 15 cases; its etiological role was proved in these cases by disappearance of oedema on protein diet.

(v) Hypo-calcaemia was demonstrated in 7 cases, its importance was demonstrated in 3.

(vi) Four cases showed no changes in the blood chemistry. The oedema disappeared only after improvement of the anæmic state, suggesting the latter as the important factor.

(c) *Stomatitis and Glossitis*.—The occurrence of glossitis in helminthic anæmia is not uncommon, some degrees of it can be detected in about 12 per cent of cases. It is related mainly to :—

(i) *Condition of Gastric Acidity*.—Being more common with cases showing anacidity, but it has been occasionally found with hyperchlorhydria.

(ii) *Intestinal Lesions* existed more with intestinal Bilharziasis.

In these cases it is either a part of a generalised pathology of the gastro-intestinal tract, *i.e.* gastritis, enteritis and colitis, or it may constitute one of the manifestations of a pellagreus state. We were not able to differentiate between these two etiologically different lesions of the tongue.

(d) *Dysphagia* : was found in two cases of intestinal Schistosomiasis with achlorhydria. In one of them the combination of Plummer-Vinsons syndrome was complete.

(e) *Nails* : Spoon shaped nails (concave) were met with in 14 cases, mostly ankylostomiasis. 10 were achlorhydric and 4 were hypochlohydric.

Convexity of nails up to marked clubbing has also been encountered in some cases of Bilharzial Dysentery, especially with hepatic involvement.

(f) *The Cardio-Vascular System.*

(i) *Pulse-Rate*.—Tachycardia due to increased circulatory rate is the usual finding in these cases. Bradycardia has been occasionally met with in Ancylostoma cases. Extrasystoles were met with in three cases.

(ii) *Blood Pressure*.—There is a tendency of the systolic pressure to be slightly higher than normal, while in severe chronic cases, especially dehydrated Bilharzial Dysentery Anaemia, figures as low as 90 have been found. The diastolic pressure is lower than normal with the result that the pulse pressure is markedly increased, this gives the pulse a collapsing character. As to the mechanism of the low diastolic pressure in these cases, investigations are still going on.

(iii) *Cardiac Enlargement*.—A certain degree of cardiac hypertrophy could be demonstrated in some cases. This is the result of increased cardiac output dependent on the anaemia. Dilatation follows from myocarditis (anaemic and possibly also toxic).

No increase in the right heart could be detected in uncomplicated cases.

(iv) *Murmurs*.—The kinds, character and distribution of the usual haemic murmurs are under analytical study.

A functional diastolic murmur could be demonstrated in two cases : one apical and one aortic. Organic causes were excluded by radiological and electrocardiographic evidence, while their relation to the anaemia has been further confirmed by disappearance when the latter was cured.

(v) *Cardiac Failure* of the congestive type is extremely uncommon, being met with in one case during the whole study. In such cases a moderate lung affection, which in itself is incapable of straining the right heart in a normal patient, will precipitate such a picture in a case of anaemia with secondary generalised myocarditis. Evidence of left ventricular failure (gallop rhythm, basal lung congestion, etc.) were not found in this series, possibly due to limited efforts from the anaemic state.

#### 5.—*Mechanism of Production.*

The great part of this work is experimental (see report of Section of Experimental Pathology and Medicine). Some clinical observations and experiments on cases bearing on this point have been referred to elsewhere (see Ankylostomiasis and treatment of Helminthic Anaemia).

#### 6.—*Investigations on the Treatment of Helminthic Anaemia.*

Various procedures have been under trial for the treatment of these anaemias during the last two years. The efficacy of the various methods can be judged by the following :—

(a) General condition of patient, clinical improvement, increase of weight, etc.

(b) Haemoglobin estimation and reticulocytic count every other day, complete blood picture every week.

Eosinophilic curves were followed in some cases.

The methods used up to the present time with a short account of the results obtained will be now summarised :—

(a) *Treatment of Parasitic Infection.*—Complete expulsion of parasites did not result in any improvement in the anaemia of these cases.

(b) *Full Hospital Diet.*—A well balanced diet with sufficient proteins did not produce any effect in the way of improvement of the anaemia in these cases, neither before nor after expulsion of worms.

(c) *Liver Therapy* :—

(i) *Raw Liver by Mouth.*—Three hundred grams of raw liver minced in soup daily for a period of 2-4 weeks did not produce any increase in the haemoglobin of these cases even after the expulsion of the parasites.

(ii) *Injections of Concentrated Liver Extract* in the form of Cam polon (Bayer) and Hepracton (Merck) have been given intra-muscularly daily to 67 cases.

These injections were used :

As a therapeutic test to detect or prove the absence of masked cases of pernicious anaemia (complicated with hypochromia from helminthiasis) especially in the achlorhydric group. In none of these cases a reticulocytic crisis occurred, suggesting their non-macrocytic nature.

As a therapeutic measure : no rise of haemoglobin, red blood cells or reticulocytes followed the administration of 2 c.c. daily intra-muscularly for fifteen days.

*Iron Therapy*.—The recent demonstration of the effectiveness of large doses of iron in hypochromic anaemias and the absence of its previously claimed bad effects on the gastro-intestinal tract, have encouraged us to use big doses of various iron preparations in the treatment of helminthic anaemias in which a quick and prompt improvement in the blood picture is sometimes urgently needed.

The iron preparations used in the present series of investigations are :—

*Ferrous Iron*.—Blauds pills, ferrous sulphate, ferrous lactate.

*Scaly Iron*.—Ferri et ammonia citrate, Ferri et Quinine citrate.

*Organic Iron*.—Iron peptonate, Ferronovin (Promonta).

Comparison of the efficacy of these various preparations is made by estimating the doses necessary to produce the maximum reticulocytic response in the usual time.

The efficiency of the various iron preparations used is given in the following :—

Blauds Pill.   ...   ...   ...   ...   ...   Four Pills T.D.S.

Ferrous sulphate and ferrous lactate ... 1 grm. T.D.S.

Ferri et Ammon cit.   ...   ...   ...   ...   2 grms. T.D.S.

The therapeutic action of iron in helminthic anaemia depends on various factors ; these will be discussed in detail in the publication and will only be enumerated here :

(a) *Cause of Anæmia*.—It is more effective in ancylostoma anaemia than in intestinal bilharzial anaemia.

(ii) *Degree of Anaemia.*—The response is greater with lower initial haemoglobin values.

(iii) *Presence or absence of Parasites* during administration.  
The first retards the latter increases the action.

(iv) *Form and dose of iron used.*

(v) *Presence or absence of Factors Interfering* with the action of iron:

Deficient absorption : presence of achlorhydria or enteritis diminishes response to iron.

Haemorrhage.

Sepsis (in our cases pyelitis or cystitis).

Hypothyroidism : in 7 cases showing enlarged thyroid, a further rise of haemoglobin (10 per cent) could be produced by the addition of thyroid extract after maximum iron action.

Arteriosclerosis.

#### *Iron Injections:—*

12 cases were given daily the maximum pharmacopial dose of *Injectio Ferri* (2 c.c.) intramuscularly.

6 were given 15 injections : haemoglobin rose 1-5 per cent at end of treatment.

6 were given 20 injections : haemoglobin rose in 3 cases 2 cases to 5 per cent and 1 case to 10 per cent.

These results showed definitely that injections of iron in the maximum dose are not capable of raising the haemoglobin in these cases of helminthic anaemia more than 10 per cent within three weeks.

Larger doses are now under trial to estimate the maximum dose and period necessary for treatment as compared with iron by mouth. But it can be seen that this method of treatment is not practical owing to its inconvenience and being more expensive. Big doses are intolerable and have no place in the treatment of these anaemias unless iron could not be given by mouth. Small doses are practically useless.

The following methods of treatment are still under experimental studies. Results will be published when sufficient data are available.

(e) *Arsenical preparations.*

(f) *Copper* in the form of copper sulphate solution by mouth.

(g) Manganese, cobalt salts.

(h) *Marmite and other vitamin preparations.*

## II.—RARITY OF PERNICIOUS ANAEMIA IN EGYPTIANS.

In no case, out of a total of 574 cases of anaemia analysed, was macrocytic anaemia found.

The investigations done in this respect were :—

(1) Constitutional achylia was looked for in healthy children, (185 cases) and in no case it was found.

(2) Therapeutic liver injections were given to 67 cases of achlorhydric anaemia ; in no case reticulocytic crises occurred.

(3) In every case of achlorhydric anaemia (114 cases) macrocytosis was looked for by the haematocrit with negative results.

As to the responsible factors for the rarity of pernicious anaemia in Egyptians, they will be discussed more fully in a separate publication.

## B.—ANKYLOSTOMIASIS.

### I.—CLINICAL OBSERVATIONS.

Selection of pure cases of Ancylostoma infection for the purpose of studying Ancylostoma anaemia has enabled us to study some clinical manifestations which could be reasonably accounted for by this infection. The following clinical findings need to be emphasised here as little is mentioned about them.

(1) *Anaemia.*—The role of Ancylostoma infection in the production of anaemia has been referred to. The mechanism of its production is under investigation in both patients and dogs experimentally infected with *Ancylostoma caninum*. The haemotological picture, with the exception of some details which will be mentioned later, has been described under helminthic anaemia. Complete biochemical studies are as well being carried out.

(2) *Wasting* is not a prominent feature of Ancylostoma cases however intense the infection is and however severe its clinical manifestations. Certain degree of muscular wasting occurs, sometimes leading to difficulty in walking. It is usually masked by the occurrence of some oedema. In children, endocrine hypofunction may lead to plumpness and dwarfism. A case of Brissaud's hypopituitarism

has been met with in this study. Enlarged thyroids have been observed in seven cases in this series. If a case of pure Ankylostomiasis shows marked wasting, search should be made for another concomitant condition, e.g. dysentery, diabetes, etc. Tuberculosis is very uncommon with severe Ancylostoma anaemia. Such rarity of association is as well known with pernicious anaemia.

(3) The skin in these cases is characteristically pale yellow with no greenish tint, thus differing from that of pernicious anaemia. No subicteric scleral pigmentation peculiar to haemolytic states or hepatic disease is seen in cases of pure Ancylostoma infection. The colour of the skin was taken as evidence of liver trouble in a child of four years who was put under treatment for hepatic affection for four months during which period his anaemia progressed and by the time he was detected to be suffering from Ancylostoma infection, his haemoglobin was 18 per cent, his liver was four fingers below the costal margin ; but in spite of this no jaundice, latent or active was found. The icterus index was normal, no bile or urobilinogen was found in the urine. He was treated for Ancylostoma anaemia, his haemoglobin reached 80 per cent and liver shrank to normal size.

(4) *Gastro-Duodenitis* producing epigastric complaints is frequent in Ankylostomiasis. The role of Ancylostoma infection in its production has been demonstrated by A. Hassan and M. Salah.

Four cases of duodenal ulcer syndrome solely due to ankylostomiasis and cured after removal of worms have been previously described. Hypochlorhydric and achlorhydric (responding to histamine) gastritis has been met with as well in such cases. 8 cases of achylia not responding to histamine have been found in Ankylostomiasis. Of these 5 cases were associated with pellagric manifestations while 3 cases were without any pellagrous signs. In this latter group hydrochloric acid appeared after treatment in 2 cases. (See Pellagra).

Diarrhoea has been recorded in 17 cases in this series. 11 of these showed achlorhydria (seven) and hypochlorhydria (four) and they improved after HCl administration.

Occult blood in the stools is constant in these cases. In the same case it can be demonstrated every day.

CharcotLeyden Crystals were found in some cases. Their relation to the occult blood and degree of eosinophilia is under investigation.

(5) *Fever* occurred in eight cases. They were all severely anaemic (20 per cent). Bacteriological and Serological investigations of the blood, urine and faeces failed to find a cause. When the haemoglobin improved under iron treatment the temperature subsided completely suggesting its relation to the anaemic state rather than to Ancylostoma infection.

Similarity of such cases clinically to subacute bacterial endocarditis has been referred to elsewhere.

(6) *Oedema* in Ankylostomiasis (see oedema in helminthic anaemia).

(7) In the present series 2 cases of *Ancylostoma* anaemia have been found associated with signs and symptoms of *subacute combined degeneration* of the spinal cord without any evidence of pellagra. In one case the blood picture was normocytic and the gastric secretion was hypochlorhydric, the other was microcytic and achlorhydric. The first case was treated with massive doses (9 grms.) of iron ammon. citrate daily. The anaemia improved as well as the subjective nervous symptoms, but all the nervous signs remained constant.

An etiological relationship between Ankylostomiasis and these nervous manifestations suggested by these two cases could not be proved.

## II.—LARVAL INVASION IN ANKYLOSTOMIASIS.

Ashford recently described the symptomatology of acute *Ancylostoma* infestation. We had the chance of following a case from the date of infection and to have complete data of another case.

Our findings will be published elsewhere, they will be only here enumerated :—

(1) Itching at site of entrance.

(2) Fever : irregular intermittent, occurring in the first two weeks.

(3) Cough with sputum was complained of in both cases. Signs of bronchitis and eosinophils in the sputum were demonstrated in one case.

(4) Gastro-intestinal disturbances : Epigastralgia was a prominent early symptom and occasionally vomiting.

Diarrhoea occurred in both cases, occult blood was demonstrated in one case but no microscopic blood seen.

(5) Giddiness and a sense of general fatigue.

(6) Haematological picture : Leucocytosis mainly eosinophilic (in one case 70·5 per cent) was found in both cases.

*Anaemia* with the picture described previously was found in both cases, in one case the haemoglobin was 15 per cent at the end of four months while in the other case it was 40 per cent after 7 months.

### III.—DEGREE OF INFECTION IN ANKYLOSTOMIASIS.

22 cases have been analysed as to the relation between the intensity of infection and the clinical manifestations. The number of worms expelled from the patient by repeated Anthelminthic administration was the criterion of the degree of the infection, as the egg count, in addition to its variability with the character of the stools and inconstancy, only tells roughly the number of female worms.

The highest number of worms expelled in this series was 423 (185 males and 238 females); the lowest was 4 (one male and three females); all grades of haemoglobin were present from 10 per cent to 100 per cent suggesting greater pathogenicity of *Ancylostoma duodenale* than *Necator americanus*.

The following deductions could be obtained from this experiment :

(1) Males are always less than females.

(2) Resistance to treatment (number of repeated doses) does not depend solely on the number of worms harboured by the patient.

(3) The number of worms is not proportionate to the degree of Anæmia. Moderate anæmia could be found with the highest numbers while very severe anæmia with a smaller number of worms. This shows that :—

(a) Hæmorrhage is not the sole cause of the anæmia as the degree of the former should depend on the number of the worms.

(b) If an anæmifying toxin is produced by the worms, its amount and correspondingly the degree of anæmia should be proportionate to the number of worms present.

(c) That there is an additional factor in the production of the anæmia probably on the part of the patient.

(4) The degree of eosinophilia is not proportionate to the severity of infection.

### IV.—TREATMENT OF ANKYLOSTOMIASIS.

Carbon tetrachloride is the routine drug (*see O.P. report*). The question of carbon tetrachloride poisoning is under investigation in collaboration with the Biochemical Section ; the experimental part is summarised in the report of the latter section. As to the clinical aspect of the problem only a brief outline will be given here :—

(1) Analysis of symptoms occurring in patients within 24 hours after the administration of carbon tetrachloride has shown that they are probably due to a depressing cerebral effect of the drug. They

differ completely from those occurring after three or four days and usually ascribed to liver damage. They are not associated with the biochemical changes in the blood described with the latter group of symptoms and they are relieved by enemata given to help evacuation and by administering stimulants to respiratory and cardiac centres (caffeine and adrenalin).

(2) Critical studies of the various contra-indications suggested for carbon tetrachloride are necessary to decide on the effect of this drug in these cases and to help the explanation of certain points in the mechanism of poisoning. A series of experiments were undertaken in which C. T.C. was administered to various groups of cases in which such supposed contraindications exist. The results are here summarised but the final deductions will be published later;—

(a) *Repeated Dosage.*—It is generally recommended that C.T.C. should not be given in more than two weekly doses. A longer interval of three to four weeks is needed before a third dose is given. In this experiment C.T.C. is administered weekly in the usual dose until the patient is cured :

- 52 cases needed three weekly doses.
- 11 cases needed four weekly doses.
- 7 cases needed five weekly doses.
- 4 cases needed six weekly doses.
- 1 case needed eight weekly doses.

No untoward symptoms were observed in this series. The liver function tested by the galactose blood sugar curve as well as blood calcium estimation were carried out in four cases (one having 8 doses, two having 6 doses and 1 having 5 doses). No disturbance of the liver function nor reduction in blood calcium were found.

This experiment suggests that :—

- (i) An interval of a week is sufficient for the repeated administration of the drug.
- (ii) That the incidence of poisoning is not related to frequent administration. Cases of poisoning have been recorded after the first dose of the drug.

(b) 43 cases of Hepato-Splenomegaly, in which there was clinical evidence of chronic liver implication were given C.T.C. with no ill effects. 5 cases of marked cirrhosis of the liver (3 with ascites) were also given C.T.C. with no untoward effects.

This is to be expected as our studies on the liver functions in these cases showed that it is not at all or only slightly disturbed (mechanical liver lesion rather than marked cellular damage). Moreover we believe that the increase of portal pressure tends to retard the absorption of the drug from the intestines in these cases.

(c) Pregnancy was considered a contraindication to C.T.C., but in such cases with *Ancylostoma* anaemia it is more dangerous to leave the patient without treatment. Preliminary experiments (injecting C.T.C. in pregnant rabbits) have shown no special aborting effect of the drug. In choosing such cases for our experiment we were careful in excluding previous history of abortions as well as cases with syphilitic manifestations or positive Wassermann. 14 cases of pregnant women from the second to the seventh month were given C.T.C. No direct or delayed ill effects were observed.

3 cases reported themselves after delivery.

(d) Deficiency of Calcium Reserve in the Body is claimed to predispose to C.T.C. poisoning. 21 lactating women (lactation straining on their body calcium) were chosen and C.T.C. administered. No symptoms developed in this group. The blood calcium was estimated in six of these cases and found to range from 8 to 9.5 (low normal or slightly reduced).

Hypocalcaemia has been demonstrated by us in some cases of helminthic anaemia; 6 such cases with calcium values below 9 were given C.T.C. and no apparent ill effects were observed in this group too.

(e) Ulcerations of the intestine have been claimed to help the absorption of administered C.T.C.; 2 cases of typhoid fever were brought to us having been given wrongly C.T.C. They were put under observation for the development of any toxic symptoms with negative results..

57 cases of Bilharzial dysentery were given C.T.C. with no ill effects.

The object of these experiments is to analyse to what extent pathological lesions in the patient were responsible for the occurrence of poisoning by C.T.C.

#### V.—DIFFICULTIES IN THE TREATMENT OF ANKYLOSTOMIASIS

Under two conditions, jaundice and severe anaemia, the treatment of associated Ankylostomiasis has been more or less difficult as well as important.

The question of treating such cases for Ankylostomiasis was fundamental owing to its etiological role, the presence of jaundice as well as severe anaemia with its secondary manifestations (fatty liver, circulatory weakness, etc.) contra-indicate the use of C.T.C.

We have met with two cases of obstructive catarrhal jaundice with duodenitis which resisted ordinary medical treatment until the co-existing *Ancylostoma* infection was treated. Improvement of the jaundice and relief of the catarrhal obstruction progressed rapidly, possibly owing to the subsidence of the duodenal irritation. Such cases suggest the importance of treating *Ancylostoma* infection in cases of catarrhal jaundice to help the cure of the latter rather than to postpone it till the condition of the liver improves. For this purpose C.T.C. could not be used and an anthelmintic with no deleterious effect on the liver is to be substituted. Hexylresorcinol can be given a trial in such cases, but bigger and repeated dosage is needed. Ascaridol is another drug with no action on the liver and can be given in these cases.

As to the treatment of *Ankylostomiasis* in very anæmic patients with oedema, fatty livers, etc., we have definitely shown that large doses of iron could raise the hæmoglobin up to 55 or 60 per cent in spite of the presence of the worms, *i.e.* the anæmia can be treated in the presence of its cause.

When the condition of the patient improves, C.T.C. can be safely given.

The importance of this experiment has shown itself in saving the lives of some moribund very anæmic *Ancylostoma* cases where it was impossible to venture administering C.T.C. The detailed results of this experiment with hæmatological studies as well as its bearing on the mechanism of production of *Ancylostoma* anæmia will be published elsewhere.

### C.—HEPATO-SPLENOMEGALY.

#### I.—DIAGNOSIS.

To investigate such cases as regards their nature, clinical picture, etc., it is essential to define what is meant by "Egyptian or Endemic Hepato-Splenomegaly." Only few forms of Hepato-Splenomegaly possess certain clinical diagnostic features. Most of these conditions necessitate for their proper diagnosis thorough investigations to get out certain hæmatological, parasitological or serological peculiarities.

By following the criteria suggested in the previous report we were able to separate cases with syphilitic, malarial, infective factors as well as splenomegalic blood diseases. There remained a group of *Hepato-Splenomegaly-Anæmia-Leucopenia*, in which previous investigations showed their non-syphilitic, non-infective and non-hæmopoetic nature and their negativity for malarial parasites. Such an association is usually taken as diagnostic of *Egyptian*

*Splenomegaly.* We are not prepared to accept this view and no case of this nature should be accepted as Egyptian Splenomegaly before similar conditions are excluded. Other conditions which can give rise to such a combination and therefore should be considered in the diagnosis of any case of Splenomegaly with Anæmia and Leucopenia in Egypt are:—

(1) *Chronic Malarial Hepato Splenomegaly* without parasites in the peripheral blood. Provocation by Adrenalin injections and ice bag to the spleen helped the appearance of parasites in the peripheral blood only in a small percentage of such cases. A rise of temperature of 1 to 2 degrees within two hours from the injection as well as the appearance of pigmented monocytes may be of help in diagnosing such cases.

(2) *Visceral Leishmaniasis*.—The report of cases of infantile Leishmaniasis in Alexandria has stimulated us to look for such condition especially in hepato-splenomegaly of children. 17 cases, fitting clinically and hæmatologically with Kala-Azar, were punctured in the Liver with negative results for Leishmania.

It is difficult to separate cases of Kala-Azar from the so-called Egyptian Splenomegaly on clinical and hæmatological grounds only. Even the adult form of Visceral Leishmaniasis can be encountered in Egypt in people infected in the Sudan. Also adult cases have been reported by some observers (Phillips and Petridis). Until the question of its existence or absence in Egypt is settled, Visceral Leishmaniasis should be taken into consideration in diagnosis of cases of Splenomegaly in Egypt.

(3) *Splenomegalic form of Hodgkins Disease* without apparent glandular enlargement offers great difficulty in diagnosis. Leucopenia, anæmia and eosinophilia are common with it. A case of this nature under the diagnosis of Egyptian Splenomegaly with purpura was found only in the post-mortem room to be Splenomegalic Hodgkins.

(4) *Gauchers Disease (or Niemann-Picks)*.—May be associated with anæmia and leucopenia thus simulating the endemic disease. It is a rare condition and no case has been yet recorded from Egypt but there is no reason why it should not be present.

(5) *Aleukaemic Leucosis (myelosis or Lymphadenosis)*.—May show splenomegaly, anæmia and leucopenia. The latter does not exclude a leukæmic state. Immature cells are to be looked for in such cases. In one of our cases of splenomegaly the presence of  $3\frac{1}{2}$  per cent basophile leucocytes gave us suspicion of the possibility of aleukæmic myelosis. The repeated absence of immature leucocytes

and the reduction in the percentage of the basophil leucocytes to normal after the improvement of the anaemia, excluded this possibility.

(6) *Splenic Vein thrombosis* gives a picture indistinguishable from the so-called Egyptian Splenomegaly. The possibility could not be excluded except during the operation although repeated haematemesis in a case without signs of marked collateral circulation as well as tenderness of the enlarged spleen should raise suspicion of this possibility.

It can be seen that although the investigations done in these cases are important to exclude the forms with demonstrable etiological factors, they are not sufficient to separate the so-called Egyptian Splenomegaly from such very similar conditions as mentioned above. Diagnosis has to be arrived at by more drastic measures such as splenic puncture, bone-marrow puncture or even histology of the removed spleen.

These procedures suggested may appear as un-necessary to the ordinary clinician, but for the proper diagnosis and investigation of the nature of a disease yet unsolved they are of vital importance.

Following the lines of investigation suggested in the previous report we were able to study and analyse 103 cases of Hepato-Splenomegaly in our hospital, our observations will now be considered.

## II.—RELATION TO INTESTINAL SCHISTOSOMIASIS.

The following table shows the relation of the so-called Egyptian Splenomegaly cases to both urinary and intestinal schistosomiasis :—

Clinically Endemic Splenomegaly :103.		Sch. m. Sch. h.		
With Intestinal Bilh.	67	alone	39	37 2.
	...{	with urinary	28	21 7.
Without Intestinal Bilh.		Urinary 23. No Bilh. at all 13.		

The Bilharzia cutaneous reaction was positive in 6 out of the 13 negative cases. The 7 cases in which the cutaneous reaction was positive were :

- 2 Leukaemia.
- 1 Haemolytic Anaemia.
- 2 Syphilitic.
- 1 Amoebic Dysentery.
- 1 Endo-carditis lenta.

The intimate association of Egyptian Splenomegaly with intestinal Bilharzia concluded from previous Epidemiological Surveys could not be proved in every case for the following reasons:—

(a) Difficulty of demonstrating Bilharzia ova in the stools in some cases owing to their small number and intermittence of their discharge especially in the non-dysenteric cases. This could partially be overcome by using the swab method of examination repeatedly on consecutive days until a positive result is obtained. This has certainly detected many positive cases ; and has only exceptionally failed in very few ones (4) where ova could only be demonstrated either by scraping through a sigmoidoscope or by swabbing after irritating the colon by a cathartic (*see* previous report).

(b) Some cases present themselves after having one or more tartar emetic courses for their Bilharzia (whether intestinal or urinary) and show no ova in the stools as they are cured of their Bilharziasis. In such cases some evidence of previous intestinal Bilharzia symptoms may be absent. Thickened sigmoid has been found in some cases without evidence of intestinal Bilharzia. Sigmoidoscopic evidence of Bilharzia lesions : papillomata ; submucous patches, etc., are usually found as these are not affected by antimony treatment. Their absence does not exclude high lesions unreachable by the sigmoidscope.

The Bilharzia cutaneous reaction detected cured cases but positive information from it alone is incomplete :—

It did not differentiate between old urinary and old intestinal Bilharzia existing in the same case. Nevertheless, a negative B.C.R. in a case of splenomegaly is a significant finding and should be taken as a strong evidence against its endemic nature. Other causes should be looked for. (*See Table*). During this year 7 cases were negative for Bilharziasis by history, excreta examination, sigmoidoscopy and B.C.R. Investigations of these cases for other possible causes showed the following forms :—

2 cases Spleno-Medullary Leukæmia.

1 case Hæmolytic Anæmia.

2 cases Syphilis.

1 case Amœbic Dysentery.

1 case Endocarditis lenta.

This analysis shows the difficulty of obtaining evidence of intestinal Bilharzia in some cases and the methods of looking for it which should be done in every case. It also shows the great significance of a negative B.C.R. in the diagnosis of hepato-splenomegalic diseases

in this country. Intestinal schistosomiasis may be due to *S. mansoni* or *S. haematobium*. Some of the cases of typical splenomegalies came from Upper Egypt where *S. mansoni* does not exist. It is the intestinal infection and not the species of schistosoma which is significant.

### III.—CONDITION OF THE LIVER.

Evidence of liver implication could be demonstrated in every case diagnosed as endemic splenomegaly in the previous series. This implication is manifested by enlargement of the liver, hard consistency with sharp edge, irregularity and nodulation of the surface, or shrinkage of the liver leading to development of collateral circulation (external or internal or both).

From clinical observations one can safely state that liver implication is present in every case of enlarged spleen of the endemic type and that this precedes the enlargement of the spleen as felt clinically. Enlargement of the liver is fairly common in both types of Bilharziasis without enlargement of the spleen ; but enlargement of the spleen without liver implication indicates the possibility of other etiological factors.

The enlarged liver in these cases is usually not tender. If tenderness of the liver is found, a complicating factor should be looked for. In seven cases in our series the liver was tender. In three of these amoebic infection was demonstrated, in two a cardiac element in the hepatic enlargement was demonstrated, in one case toxic hepatitis with jaundice was complicating the picture, and in the remaining case no explanation could be demonstrated although the possibility of hepatic vein thrombosis ? (Chiari's disease) was considered but only on clinical grounds.

*Liver Functions.*—Detailed studies of the liver functions in various stages of the disease are being made ; these studies will be discussed fully later.

### IV.—CLINICAL ASSOCIATIONS.

Certain clinical associations have been observed in the analysis of the present series ; the detailed consideration of these will be published later. They are only to be enumerated here.

(a) *Relation to Dysenteric Symptoms.*—Out of 67 cases positive for intestinal schistosomiasis, only 14 cases showed dysenteric manifestations. They showed the papillomatous form of intestinal lesion. The non-dysenteric group showed either very few or no papillomata at all.

This shows that the endemic form of splenomegaly is associated more frequently with the non-dysenteric, non-papillomatous form of intestinal schistosomiasis.

(b) *Separated Recti* are found in the great majority of these cases whether the enlargement of the spleen is sufficient to raise the intra-abdominal pressure or not. Widening of the costal angle, which is a constant feature of these cases, is possibly a contributing factor in the production of this separation. Wasting is a possible third factor.

(c) *Exaggerated Abdominal Reflexes* were demonstrated in four cases. All were children from seven to sixteen years old. In two of them congenital syphilis was demonstrated but with no other signs of implication of the nervous system.

(d) *Enlarged Parotids* have been met with in 11 cases ; they could also be found in cases of liver cirrhosis without splenic enlargement.

(e) *Clubbing of Fingers.* Marked convexity of the nails was found in about 25 per cent of cases, this advanced to marked clubbing in 4 cases only in which no evidence of cardiac or pulmonary factor was found. Such convexity of nails was also seen in Bilharzial dysentery without splenomegaly.

(f) *Certain Endocrine Disturbances* have been reported with some forms of splenomegaly. In our present series of cases we met with the following conditions :—

Brissaud's Hypopituitism	...	...	...	1 case
Progeria	...	...	...	2 cases
Hirsutism	...	...	...	1 case
Diabets insipidus	...	...	...	1 case

These cases will be described more fully elsewhere.

## V.—EFFECTS OF SPLENECTOMY.

4 cases have been studied up to the present time as regards the effect on :—

- (1) Blood picture.
- (2) Liver functions.

More detailed studies are being carried out now on effects on :—

- (3) Blood chemistry.
- (4) Course of the disease after splenectomy.

Details of this work will be published later.

## VI.—HEPATOLIENOGRAPHY.

Hepatoliengraphy by thorotrust has been utilised in three cases of splenomegaly during this year. The following points will be commented upon :—

(1) Attempts at *estimating the total dose* for visualising the spleen in these cases have shown that 25 c.c. are not sufficient for visualising the spleen but the liver shadow could be made out with this dose.

With a dose of 40 c.c. the spleen begins to be visible. With a dose of 75 c.c. a good shadow of the liver, but a fainter shadow of the spleen can only be obtained. No structural changes could be seen in the shadows by such doses. The shadow is of a diffuse nature. Bigger doses are under trial to obtain more dense and differentiated shadows of enlarged spleen as was obtained in some forms of splenomegalies in rats experimentally.

(2) The *method* used in injecting the patients was based on the results of experimental work on animals. An interval of two or three days between each injection is advisable to help the recovery of any disturbance of the reticulo-endothelial system that may result.

(3) *Reactions following the injection* : Flushing of the face with giddiness, sense of heat, oppression of chest and Bradycardia. One or more of these were occasionally observed in the group of cases experimented upon. These were 6 cases, 3 were cases of Splenomegaly and 3 of malaria. Liver function tests (mainly galactose blood sugar curve) showed no disturbing effect on the liver.

No increase of monocytes or anaemia as reported in experimental animals was observed after the administration of the drug.

(4) Three malarial patients from whom the parasites disappeared without treatment were injected with the drug to see if its administration in latent malaria with splenomegaly results in activation. 25 c.c. injected in a single dose did not activate the malaria infection in the three cases. Big sublethal doses resulted occasionally in partial and temporary activation of Trypanosoma lewisi and Bartonella infections in rats. It is possible that bigger single doses than 25 c.c. may activate latent malaria in man. This point is under investigation.

The details of the experimental work as well as its application to human cases will be published elsewhere.

#### D.—INVESTIGATIONS ON MALARIA

54 cases have been admitted to the in-patients during this year. Investigations on various aspects have been carried out. The following observations and findings are to be mentioned :—

##### I.—HAEMATOLOGICAL STUDIES.

Only 11 cases were found free from helminthic infections. Moreover 3 of them gave previous history of antihelmintic treatment and showed eosinophilia. All these cases were showing malarial parasites in the peripheral blood, 7 were benign tertian, 2 malignant, and 2 quartan.

The red cell count varied from 3,240,000–4,490,000 corpuscles per c.mm., the average being 3,920,000.

The haemoglobin determined by Sahli's method, ranged from 45–75 per cent. The average was 58 per cent.

The colour index averaged 0·7, the limits being 0·6 and 0·9. It can be seen that the anaemia in these cases is of a moderate degree. The low colour index suggests that the anaemia in this series is not purely haemolytic as haemoglobin reduction exceeds red cell destruction ; this means that hypochromia of the surviving cells also exists. It is more probable that this hypochromia is related to a nutritional factor rather than to malarial toxæmia, this point needs further investigation.

*The Reticulocytes.*—The average reticulocytic count of the febrile cases ranged from 0·4–2·2 per cent with an average of 0·9 per cent. In afebrile cases it ranged from 0·9 per cent to 3·4 per cent with an average of 1 per cent. In two cases of inoculated malaria, the reticulocytes remain low during the fever. This suggests that during the febrile stage the bone-marrow is depressed by malarial toxæmia, in the afebrile period the high reticulocytes suggest normoblastic activity of the bone-marrow which manifests itself still more after removal of the parasites by treatment when marked reticulocytosis occurs. In 16 cases after atebrin treatment, it ranged from 2·4 per cent to 8·2 per cent with an average of 4·9 per cent. This reticulocytic rise after treatment was less marked in the cases complicated by helminthic infection.

This shows that malarial anaemia is capable of regeneration if the infection is removed by specific antimalarial remedies because, in this condition, there is a reserve of iron in the body which can be reutilised. This is opposite to the condition in *Ancylostoma* where no regeneration takes place after removal of the parasites unless iron is supplied in sufficiently large quantities, suggesting shortage of iron in the body in the latter condition.

Morphological changes in the red cell picture met with in this series consist of anisocytosis, slight poikilocytosis and polychromasia. Punctate basophilia was seen only in 4 severe cases.

The size of the red blood corpuscles measured by the hæmatocrit method showed values for the volume index ranging from 74 to 92 with an average of 81, *i.e.* within the limits of normocytosis.

*The Leucocytic Blood Picture.*—Total count showed low-normal or leucopenia in 9 cases with a maximum of 6,600 and minimum of 3,510. 2 cases showed leucocytosis, both were children, one of them was rachitic, the other showed marked lymphocytic reaction with a total of 41,650 lymphocytes (83 per cent) that a condition of leukæmia was thought of as an association. By following the case the total count reached 13,000 after 28 days while the lymphocytic percentage was 38 per cent by that time.

Such leukæmoid reactions in malaria have been considered by some as examples of leukæmia. This case illustrates the importance of following such cases for a long time before they are commented upon.

## II.—BIOCHEMICAL STUDIES.

The icterus index estimated in 48 cases showed values ranging from 4 units to 22 units with an average of 8 units suggesting high bilirubin content of the blood in the majority of these cases as a result of the hæmolytic process.

Another evidence in this direction is given by the increase of urobilinogen in the urine demonstrated in all these cases.

Both these phenomena tended to return to normal value after anti-malarial treatment.

This increase in the icterus index and urobilinogen are not related to liver disturbance as shown by our studies on the liver functions of these cases to be mentioned soon.

*Blood-Cholesterol.*—Owing to the antihæmolytic properties of cholesterol, importance has been given to its value in the blood in cases of malaria by various observers. In 9 of our malaria cases, positive for parasites, the blood cholesterol was estimated by the method of Meyer. The values ranged from 95–154 with an average of 118. These figures suggest tendency to hypcholesterolæmia. In 5 cases of these, the cholesterol values were increased after anti-malarial treatment suggesting the etiological significance of the

latter. It is to be mentioned here that hypcholesterolæmia has been reported by us in helminthic anaemias. The association of the two conditions is frequent as shown in our series (43 out of 57), i.e. in addition to the malarial hypcholesterolæmia shown in the 9 cases the majority of malaria patients have much lower figures of blood cholesterol owing to complicating helminthic anaemia.

This association serves to disprove the suggestion forwarded by Nocht and Nauck that administration of quinine to malarial patients in the presence of hypcholesterolæmia favours the occurrence of black-water-fever. In Egypt no case of black-water-fever has been yet recorded in spite of the presence of the marked hypcholesterolæmia we have already demonstrated.

### III.—STUDIES ON LIVER FUNCTIONS IN MALARIA.

Liver functions were investigated in 12 cases of malaria, 8 benign, and 4 malignant, without any clinical evidence of liver disease.

As to the icterus index and urobilinogen, the presence of the haemolytic process in malaria gives by itself positive results and hence these could not be considered in this connection. The blood sugar curve after galactose administration is done in addition to the 5 hours galactosuria (Dr. Bauer) as this overcomes the draw-back of the absence of renal threshold for galactose and gives more accurate informations as regards assimilation of this substance by the liver. This procedure has given us good information in this connection in a previous work (*see action of antimony on the liver*). We accept as a definitely disturbed galactose test when a difference of 60 milligrams exists between the fasting and the highest blood sugar value. A difference of 50 milligrams can be taken as evidence of mild disturbance of glycogenic function.

Out of the 12 cases investigated, 3 benign cases showed definitely positive galactose, while two malignant cases showed mild positive galactose curve. This shows that the glycogenic function of the liver may be disturbed by malaria infection. This must be taken into consideration in the treatment, especially if the drug used is known to affect the liver (*see liver function tests after Atebrin treatment*).

### IV.—INVESTIGATIONS ON THE TREATMENT OF MALARIA.

The number of cases investigated is 187, of which 158 are benign tertian, 27 malignant and 2 quartan. Many of these were out-patients.

The number of cases treated and the various courses are as follows :—

Drugs given	Number treated in Hospital	Number treated in out-patient	Total
Atebrin tablets (0.3 grm.) daily for five days ...	16	26	42
Atebrin tablets (0.6 grm.) daily for $2\frac{1}{2}$ days ...	5	—	5
Atebrin ampoules (0.1) daily for 5 days ...	5	20	25
Atebrin ampoules (0.2 grm.) daily for 5 days ...	5	2	7
Atebrin Plasmochin in tablets ... ... ...	15	—	15
Atebrin followed by Plasmochin ... ... ...	5	—	5
Plasmochin simplex ... ... ... ...	—	29	29
Plasmochin co. ... ... ... ...	—	44	44
Quinine ... ... ... ...	—	8	8
No specific treatment ... ... ... ...	7	—	7
TOTAL ... ... ... ...	58	129	187

Details of this work are published elsewhere. The various observations and findings on the Atebrin treatment are to be summarised here :—

(1) The average number of rigors occurring after the beginning of treatment is 1.6. The average duration of febrile period in days is 1.9. A clinical cure usually preceded the parasitic cure.

(2) The average number of days of treatment to effect a parasitic cure was somewhat less than 3 days. The parasites generally disappeared in the following order, rings, schizonts, trophozoites, and lastly the gametocytes. The crescents of subtertian malaria were not eradicated by the five days course of treatment.

(3) The spleen was reduced in size in 80 per cent of cases.

(4) No peculiar action of Atebrin on the blood picture has been observed. Reticulocytosis occurred in 16 out of 18 cases studied after the Atebrin course.

(5) The glycogenic function of the liver tested by galactose was found to be disturbed at the end of treatment in three cases where it was previously normal. This disturbance has been shown to be only temporary.

(6) The following untoward symptoms occurred, yellow colouration of the skin, cerebral irritation (one case), slight temporary liver disturbance.

(7) Observation of cases for a period of three months following cure showed a relapse rate of about 24 per cent.

(8) Combined treatment of Atebrin and Plasmochin showed no advantage over the former alone except in the malignant form as it helps in eradicating the crescents. Some symptoms occurred in this combined treatment.

As a conclusion, these investigations show that Atebrin is an efficient anti-malarial drug bringing about a quick clinical relief as well as rapid parasitic eradication except in the malignant type where it should be followed by a short course of Plasmochin. The course is short (3 tablets daily for 5 days), it is without the drawbacks of Quinine and Plasmochin. The few disadvantages it possesses are trivial.

#### V.—THERAPEUTIC MALARIA IN NERVOUS SYPHILIS.

The cases chosen for this purpose were two cases of early nervous syphilis (optic type) in whom no objective signs were present except Argyll-Robertson pupil (unilateral), a positive Wassermann and signs of retro-bulbar implication. The object of choosing such cases is their early character and progressive nature to complete blindness which cannot usually be stopped by ordinary antisyphilitic treatments. The method of inoculation used was the intravenous route. Blood of a malarial patient is taken at or just after the rigor and injected intravenously in the patients to be infected. The object of taking the malarial blood about the time of the rigor is that it contains young parasites which, if haemolysis occurs from heterogenous grouping, can enter the red cell of the injected patient. The amount of blood to be injected depends on the parasitic content as shown by a parasitic count done on the malarial blood at the time of injection.

*Protocols* of these two cases will be described in detail elsewhere. The important observations met with will be enumerated here :—

(1) The incubation period was 9 and 11 days respectively.

(2) Both cases developed a quotidian fever with daily rigors as the original malarial patient from whom they were infected, whose blood contained double benign tertian cycles.

(3) It was noticed that the febrile attacks differed in their degree and clinical manifestations. One day they are associated with a severe rigor a very high temperature, the next day no rigor, less temperature and vomiting; on the third day the attack is similar

to that of first day and so on, *i.e.* alternating every other day attacks simulate each other. This occurred in both cases. This observation suggests the possibility of the presence of two strains of the benign tertian parasite differing in their virulence and resulting in different clinical pictures or difference in the number of parasites in each cycle.

(4) Both patients were allowed seven rigors and then treatment was given. In the first case atebrin and plasmochin 0·1 T.D.S. were given daily starting after the fifth rigor. Two more rigors occurred ; and after one day of treatment jaundice appeared which was partly hæmolytic but as well hepatic as shown by the levulose tolerance test. The occurrence of jaundice in this case is exceedingly interesting because the patient from whom the blood was taken developed on the fourth day of treatment with plasmochin and atebrin jaundice but with a severe hæmolytic crisis. Whether this is a coincidence or due to a hæmolytic character of the parasite concerned needs further investigations. In both cases marked hæmoglobin reduction (from 95 per cent to 65 per cent in the first case and from 90 to 60 in the second case) occurred by the end of seven daily rigors.

(5) Both cases were given antisyphilitic courses. After observations for over a year, both cases showed an exceedingly satisfactory result in checking the progress of the lesion making it stationary.

(6) Observations on the blood picture, blood cholesterol and icterus index showed reduction of the first two and increase of the third during the course of fever. Reticulocytosis and increase in cholesterol followed the treatment.

#### E.—PELLAGRA

14 cases of Pellagra were admitted to the inpatients this year. They were investigated on the same lines as mentioned in the previous report.

#### I.—STOMACH.

The gastric secretion was studied by the alcohol-histamine method. This method gave a lesser percentage of achlorhydria in this condition than that reported by us last year with the oatmeal method. This is due to the fact that alcohol is a gastric stimulant. If hydrochloric acid fails to appear after alcohol administration, histamine was injected and resulted in the appearance of acid which was previously absent in some cases.

The interpretation of the results obtained from this study will now be summarised :—

(1) All forms of disturbances of gastric secretion were met with in the present series (14 in-patients and 7 out-patients) :—

Achylyia gastrica	...	...	...	...	...	6 cases.
Achlorhydria (histamine)	...	...	...	...	3 cases.	
Hypochlorhydria	...	...	...	...	5 cases.	
Normal secretion	...	...	...	...	...	4 cases.
Hyper-chlorhydria	...	...	...	...	...	1 case.

(2) After treatment of parasites and cure of Pellagra (temporary in the 14 cases), improvement towards normality occurred in 3 cases (2 hypochlorhydria and 1 hyperchlorhydria); other cases remained the same at end of treatment.

(3) Four cases have been submitted to stomach washes for a period up to 5 months, HCl appeared (and only after histamine) in one case after  $1\frac{1}{2}$  months treatment. This case was previously achylic (histamine negative). This shows that :—

(a) A negative response to histamine does not suggest an unrecoverable loss of function of gastric glands as generally accepted.

(b) Achylyia of Pellagra, if advanced, does not respond to stomach washes, but if of short duration, return of HCl may occur under local treatment.

(4) That gastritis is the pathological basis for these disturbances of the gastric secretion in our cases of Pellagra is shown by :—

(a) Demonstrating signs of gastritis in all our cases.

(b) Following four cases for a period of about one year, the following changes in the gastric secretion show that the underlying lesion is a progressive gastritis leading to gradual loss of function of the gastric mucosa :—

Case 1 : Hyperchlorhydria changed into hypochlorhydria.

Case 2 : Hypochlorhydria changed into achlorhydria (histamine positive).

Case 3 : Normal secretion changed into hypochlorhydria.

Case 4 : Achylyia gastrica remained as achylyia gastrica.

Investigation on the stomach condition in Pellagra is still going on. Gastroscopic and radiological investigations correlated with the results of gastric secretion studies will be published when sufficient data are available.

## II.—INTESTINES.

*Association with Intestinal Parasites.* All our cases were associated with intestinal parasites, 9 cases out of 14 showed intestinal Bilharziasis infection with Dysentery.

Evidence of diminished absorption from the intestine in some cases is given by finding a blood sugar curve suggestive of such a condition after administering glucose by mouth in 10 out of 14 cases.

*Diarrhœa* (non-dysenteric) was found in 5 cases in this series. On 3 occasions, it was associated with absence or diminution of HCl. The administration of HCl resulted in improvement in two cases. This shows that diarrhœa in Pellagra may be of gastrogenous origin.

## III.—NERVOUS MANIFESTATIONS.

Two cases of lateral sclerosis and one case of sub-acute combined degeneration were met with in this series. Massive iron therapy improved the subjective symptoms in two of them, but no change was found in the physical signs.

## IV.—THERAPEUTIC INVESTIGATIONS.

The fallacy of interpreting the results of therapeutic trials in Pellagra in the in-patients has been definitely shown in the present series where two cases showed improvement and disappearance of rash within four weeks of hospitalisation without any therapeutic interference. Addition of hospital diet helped the recovery of another 3 cases in a shorter period.

As a result of these observations, therapeutic trials are carried out, keeping controls without any treatment for comparison. The ideal way of studying this point is to try the therapeutic measures in the out patients where the patients can be kept under their conditions of work, diet, etc. This could not be done here as the patients come from the provinces.

Results of these investigations and the effect of various therapeutic procedures on the various manifestations of the disease will be reported when sufficient data are available.

#### V.—SECONDARY PELLAGRA.

Pellagric manifestations have been reported to occur without dietary deficiency in cases with organic diseases of the alimentary canal, e.g. cancer, stricture, etc. We met with a case of this kind in which pellagrous manifestations together with nutritional oedema and anaemia developed in a well-to-do lady with long standing Dysentery due to colonic papillomatosis of doubtful nature (histological examination of a removed papilla showed its non-Bilharzial, non-malignant, septic nature). Although her diet was restricted for some time, yet its nutritional value was sufficient; but in the presence of gastric anacidity, enteritis, diarrhoea and colitis, deficient absorption prevented its utilization.

#### E.—DYSENTERY.

Six cases of chronic amoebic dysentery were admitted to the in-patients this year, some cases were also investigated in the out-patient department.

The lines of investigation carried out in these cases include:—

- (1) Studies on gastric functions.
- (2) Studies on liver functions.
- (3) Therapeutic effect of various courses and combinations of treatment.
- (4) Sigmoidoscopic picture.
- (5) Hæmatological studies.

A short comment will be given here and detailed results will be published when sufficient data are available.

(1) *Gastric Secretion* was investigated in 12 cases, the results were:—

Hyperchlorhydria ... ... ... ... ... 9 cases.

Hypochlorhydria ... ... ... ... ... 4 cases.

Achlorhydria ( Histamine positive) ... 1 case.

TOTAL ... ... ... ... 12 cases.

In all cases signs of gastritis were demonstrated.

(2) *Liver Functions.*—The galactose blood sugar curve (as utilised in other investigations in this Institute) was carried out in 9 cases of uncomplicated chronic amoebic dysentery with normal findings, suggesting undisturbed glycogenic function. The bromsulphthalein test was also done in 4 of these cases and showed normal function.

This shows that in uncomplicated cases of amoebic dysentery, however chronic it is, the liver function as shown by the tests used was not disturbed.

In 5 cases of amoebiasis of liver (3 abscesses and 2 hepatitis), the galactose curve showed disturbance of function in 2 cases only (1 abscess and 1 hepatitis).

This shows that even when the liver is implicated in amoebiasis, its functions are not necessarily disturbed. This is to be expected as the lesion in these cases is not diffuse, but of a multiple localised distribution, leaving many healthy areas.

(3) *Therapeutic Trials.*—The combined course of bismuth-eme-tine-iodide + Yatrene enemata in the evening for 2 weeks, followed by a course of Spirocid. This course was carried out in 4 cases, 2 of whom reported themselves with positive relapses after  $2\frac{1}{2}$  and 4 months respectively. They were all negative from the fifth to the ninth day of treatment and showed signs of more or less complete healing in the sigmoidoscopic picture at the end of treatment.

Atebrin being allied to Rivanol and possessing an antiprotozoal effect (in Malaria), its trial in amoebic dysentery was suggested.

In vitro experiments carried out by the Protozoology Department showed that :—

Atebrin, in a dilution of 1/50,000, is lethal to the Amoebae (histolytica) in cultures.

Accordingly, 2 cases received atebrin by mouth and another 2 by enema. No effect on the Amoebae was found at the end of 5 and 7 days, although some local comfort was observed in the cases receiving it by enema.

(4) and (5) Will be commented upon later.

#### G.—SCHISTOSOMIASIS.

##### I.—BILHARZIAL TUMOUR OF SIGMOID.

Three cases were met with during this year in which a palpable tumour of the sigmoid was found associated with constipation in 1 case and constipation alternating with diarrhoea in 2 cases. All

the three cases were middle-aged men. Thus, the possibilities of cancer and diverticulitis had to be considered in diagnosis.

The Bilharzial nature of such cases was proved by demonstration of filling defects in the lumen of the sigmoid after Barium enema. These are due to the presence of papillomata. The diagnosis was confirmed in one of these cases by Post Mortem examination.

## II.—INVESTIGATION ON FOUADIN.

(1) *Fouadin Daily*: (usual doses). 20 cases.

Result.

5 negative after the third injection.

1 negative after the fifth injection.

2 negative after the seventh injection.

2 negative after the ninth injection.

5 negative after the eleventh injection.

5 positive after the eleventh injection—3 continued to the eleventh only, and 2 continued to the thirteenth and became negative.

*Toxic Symptoms* :—

Giddiness	...	...	...	...	...	...	...	...	4
Vomiting	...	...	...	...	...	...	...	...	6
Tachycardia	...	...	...	...	...	...	...	...	1
Colic	...	...	...	...	...	...	...	...	1
Diarrhoea	...	...	...	...	...	...	...	...	1

Thus these symptoms occurred in 10 out of 20 cases, i.e. in 50 per cent.

(2) *Fouadin Calcium daily*: 20 cases :—

1 neg. after seventh.

9 neg. after ninth.

8 neg. after eleventh.

2 neg. after thirteenth.

*Toxic symptoms* occurred in 14 cases, i.e. 70 per cent. Giddiness occurred in 8, vomiting in 11 (repeatedly in 4), nausea in 2, and headache in one case.

(3) *Fouadin in big doses (4-6 c.c.)* :— 10 cases.

- 2 neg. after fifth.
- 3 neg. after seventh.
- 4 neg. after ninth.
- 1 neg. after thirteenth.

*Toxic symptoms occurred in 1 case (Vomiting, Giddiness,) i.e. 10 per cent.*

These experiments show that the curative action depends on the amount of Fouadin injected while toxic symptoms depend on the cumulative effect of drug occurring with daily doses more than with bigger doses.

(4) *Fouadin Calcium Courses (2-3 c.c.)* :— 45 cases.

*Toxic symptoms occurred in 15 cases :*

- |                         |                               |
|-------------------------|-------------------------------|
| 1 neg. after third.     | Giddiness 6 cases.            |
| 2 neg. after fifth.     | Vomiting 7 cases.             |
| 5 neg. after seventh.   | Colic 2 cases.                |
| 20 neg. after ninth.    | i.e. in 49 per cent of cases. |
| 12 neg. after eleventh. |                               |
| 5 pos. after eleventh.  |                               |

This shows that Fouadin Calcium has no advantage over ordinary Fouadin neither in its curative effect nor in its toxic action.

### III.—SYMPTOMS OCCURRING DURING FOUADIN TREATMENT.

(See report on out-patients).

Only some of these need further comment here.

(1) *Temperature*.—Rise of temperature during Fouadin course occurred in 27 cases about the fourth to seventh injection.

In 18 cases a cause could be found :—

- (a) Typhoid   ...   ...   ...   ...   ...   ...   6 cases.
- (b) Pyelitis   ...   ...   ...   ...   ...   ...   7 cases.
- (c) Malaria   ...   ...   ...   ...   ...   ...   4 cases.
- (d) Abscesses   ...   ...   ...   ...   ...   ...   1 case.

Antimony has been shown to produce contraction of spleen (Chopra, etc.) ; for this reason cases with a sudden rise of temperature under Fouadin have been submitted to blood examination for Malaria.

(2) *Oedema* : occurred in 3 cases.

In one case, it was associated with redness and itching and was relieved by calcium and adrenalin. This suggests its allergic nature.

In 2 cases the renal functions were investigated and no disturbance was detected. No albumin or casts were found and no other cause could be demonstrated. In a few days, the oedema disappeared. Fouadin was being administered at the same time. These were probably also allergic.

(3) *Herpes zoster* : occurred after the seventh to the ninth injection in 4 cases—3 Fouadin and 1 Tartar emetic.

Although this condition is known to be a Virus Ganglionitis, it is possible that antimony, like arsenic, predisposes to it by irritating the ganglia, thus making them more susceptible to the action of the Virus. Examination for antimony in the cerebro-spinal fluid and its estimation, if present, is still to be done.

DIAGNOSIS OF CASES ADMITTED DURING 1933

Diagnosis	No. of Cases
Anæmias ...	67
Splenomegaly ...	17
Malaria ...	54
Filaria ...	4
Jaundice ...	24
Dysentery (amœbic)	6
Amœbiasis of Liver	5
Pellagra ...	14
Cystitis ...	12
Cancer of bladder ...	1
Leishmaniasis ...	4
Relapsing fever ...	1
Helminthiasis ...	11
Heart disease (organic) ...	10
Nervous syphilis ...	6
Tumour of liver ...	1
Cancer of liver ...	1
Hydatid of liver ...	1
Pneumonia ...	1
Appendix subacute ...	1
Hyperthyroidism ...	1
Diabetes mellitus ...	2
Diabetes insipidus ...	5
TOTAL ...	249

IN-PATIENTS TREATED DURING 1933

Month	Admissions	Discharges	Number of Diets
January ... ... ... ...	12	12	533
February ... ... ... ...	14	13	507
March ... ... ... ...	28	32	599
April ... ... ... ...	21	16	507
May ... ... ... ...	30	32	620
June ... ... ... ...	19	19	599
July ... ... ... ...	23	21	620
August ... ... ... ...	19	21	618
September ... ... ... ...	21	20	598
October ... ... ... ...	19	19	605
November ... ... ... ...	21	25	541
December ... ... ... ...	22	19	505
Total ... ... ...	249	249	6,852

### A.—List of Publications of the Staff during 1933

Serial  
Number

- 108 Parasitic Infection amongst the Labourers of the Weaving factory in Mehella el Kobra (in Arabic), by M. Khalil Bey and Dr. M. Abdel Azim (Published in the Journal of the Egyptian Medical Association, Vol. XVI, No. 1, January 1933, pp. 5-11).
- 109 The Treatment of Bilharziasis with Bismuth, by Dr. Ali Hassan (published in the Journal of the Egyptian Medical Association, Vol. 16, No. 1, January 1933, p. 96).
- 110 On Prohemistomum vivax (Sonsino, 1892) and its Development from Cercaria vivax Sonsino, 1892, by Dr. M. Abdel Azim (published in Zeitschrift für Parasitenkunde, 5. Band, 2. Heft, February 1933).
- 111 The Susceptibility of Bilharzia Miracidia to Different Salts and Different p.H., by Dr. Ali Hassan (published in the Journal of the Egyptian Medical Association, Vol. XVI, No. 3, pp. 229-231).
- 112 The Discovery of the Life-History of Heterophyes heterophyes in Egypt, by M. Khalil Bey (published in the Journal of the Egyptian Medical Association, Vol. XVI, No. 7, p. 796).
- 113 Gastric Function in the Helminthic Infection, by Dr. M. Salah el Din and Dr Aly Hassan (published in the Egyptian Medical Association, Vol. XVI, No. 8 July 1933, pp. 735-752).
- 114 The Life-History of the Human Trematode Parasite Heterophyes heterophyes in Egypt, by M. Khalil Bey (published in the Lancet, September 1933, p. 537).
- 115 Report on the Mission of the Research Institute, Public Health Department, and the Faculty of Medicine to Siwa Oasis in January 1933, for the study of Parasitic infections, Malaria and Diphtheria, by M. Khalil Bey.  
Public Health Department Publication, National Printing Office, December 1933, pp. 1-21).
- 116 The Campaign against Bilharziasis in Egypt and its results, by M. Khalil Bey and Chafei, Z. (Hygiène Méditerranéenne C.R. 1er Congrès International 1933, T.L., pp. 135-141).

**B.—Publications of the Staff during 1933 (in the press).**

1. The Biology and Morphology of the Immature Stage of *Bolitophila hybrida*, by Dr. S. Madwar.
2. The Biology and Morphology of the Immature Stage of *Pnyxia Scabiei*, by Dr. S. Madwar.
3. Biology and Morphology of *Mycetophila marginata*, by Dr. S. Madwar.
4. Biology and Morphology of *Dynastoma fuscicornis*, by Dr. S. Madwar.
5. Biology and Morphology of *Macrocera anglica*, by Dr. S. Madwar.
6. On the Life History of *Nephrostomum ramosum* Sonsino 1895. An Echinostome Parasite from *Ardeola ibis ibis* (Buff-Backed Heron), by Dr. M. Abdel Azim.
7. Enol-Keto Tautomerism, The Structure of Benzoyl Acetone, by Dr. Morton and Dr. Ali Hassan.
8. The Effect of Antimony on the Liver, by Dr. M. Salah el Din and Dr. Ali Hassan.
9. Helminthic Anæmia, by Dr. M. Salah el Din.
10. Rarity of Pernicious Anaemia in Egyptians, by Dr. M. Salah el Din.

## Administrative Report

### 1.—PERSONNEL.

The personnel of the Research Institute and the Endemic Diseases Hospital, as sanctioned by the Budget of 1933–1934, are as follows :—

Number	Post	Grade	Remarks
1	Director ... ... ... ... ...	—	Voluntary Worker.
1	Biochemist ... ... ... ...	4th	
1	Parasitologist ... ... ... ...	4th	
1	Medical Entomologist ... ... ...	4th	
1	Clinical Pathologist ... ... ...	5th	
1	Bacteriologist ... ... ... ...	5th	Vacant.
3	Medical Officers ... ... ...	6th	
1	Sanitary Engineer ... ... ...	5th	On mission.
1	Clerk ... ... ... ...	8th	
1	Clerk ... ... ... ...	8th	Hors Cadré.
1	Moawin ... ... ... ...	Hors Cadré	
1	Molahéz ... ... ... ...		"
7	Laboratory Assistants ... ...		"
5	Nurses ... ... ... ...		"
8	Male and Female Attendants ...	„	

### 2.—EXPENDITURE.

The total expenditure during 1933 was L.E. 5,756·818 mills. The details of the expenditures are as follows :—

		L.E.	M.
Salaries of Permanent Staff	... ... ... ...	2,784	500
Salaries of Hors Cadre Staff	... ... ... ...	933	383
Transport, Travelling Allowance and Expenses	...	103	906
Food of In-patients and Employés...	... ... ...	190	039
Food of Experimental Animals	... ... ...	52	018
Gas, Light and Water	... ... ... ...	221	602
Telegrams and Telephone	... ... ... ...	14	360
Equipment, Furniture and Laboratory Materials.	1,390	,017	
Uniforms	... ... ... ...	8	—
Petty Expenses	... ... ... ...	5	275
Books and Journals	... ... ... ...	51	198
Purchase of Experimental Animals	... ... ...	2	520
TOTAL	... ... ...	5,756	818

The cooking and washing are still carried out by the adjoining Anti-Rabic Institute. The arrangement was resorted to for the sake of economy. Sometimes, however, difficulties arise. It is hoped in the near future to establish a kitchen and a wash house for the service of the Institute.

*Buildings :—*

The western fence of the Institute is not yet erected. A new street will be opened between the Institute and the Nile but the necessary expropriation formalities are not yet complete. To the south of the Institute lies a plot of land of about 2,100 square metres reserved for future extension.

*Visitors :—*

During the year, the Institute and Hospital were visited by several distinguished people, amongst whom were :

1. Dr. Shneider de Vittel.
2. Sir George Buchanann, Director Public Health Department of Great Britain.
3. Dr. Regaud, Director Curie Institute of Radium, Paris.
4. Prof. Morawitz, Dresden.
5. Dr. V. Heiser, Rockefeller Foundation.
6. Dr. Lithby Tidy, London.

*Library :—*

Arrangement has been made with the Public Health Library for transferring several journals dealing mainly with tropical medicine and parasitology to be permanently kept in the Institute.

Provision has also been made in the budget by allotting a sum of L.E. 100 to cover the subscriptions to journals necessary for the maintenance of the library and the purchase of such text books as thought essential for occasional reference.

*Missions :—*

Dr. Ali Hassan, Biochemist to the Institute, has been on mission for six months from August to December to study Spectral Analysis in the University of Liverpool.

Dr. M. H. el Betache completed with success his course of study for the Diploma of Public Health and Tropical Medicine in the Faculty of Medicine, Cairo.

Dr. G. Rose, Medical Advisor to the Ministry of Interior of Chekiang, China, has been recommended from the International Health Board of the League of Nations to visit the Institute and study the prevention and control of Schistosomiasis in Egypt.



